Rock Products

THE INDUSTRY'S RECOGNIZED AUTHORITY

NOVEMBER, 1938

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SMIDTH MACHINERY
FOR
CEMENT · LIME · ORE

The illustrations show some of the machinery in various countries. Spread ing all. However, Smidth machinery

64 COUNTRIES OF THE

250
UNAX ROTARY KILNS
have been installed
throughout the world

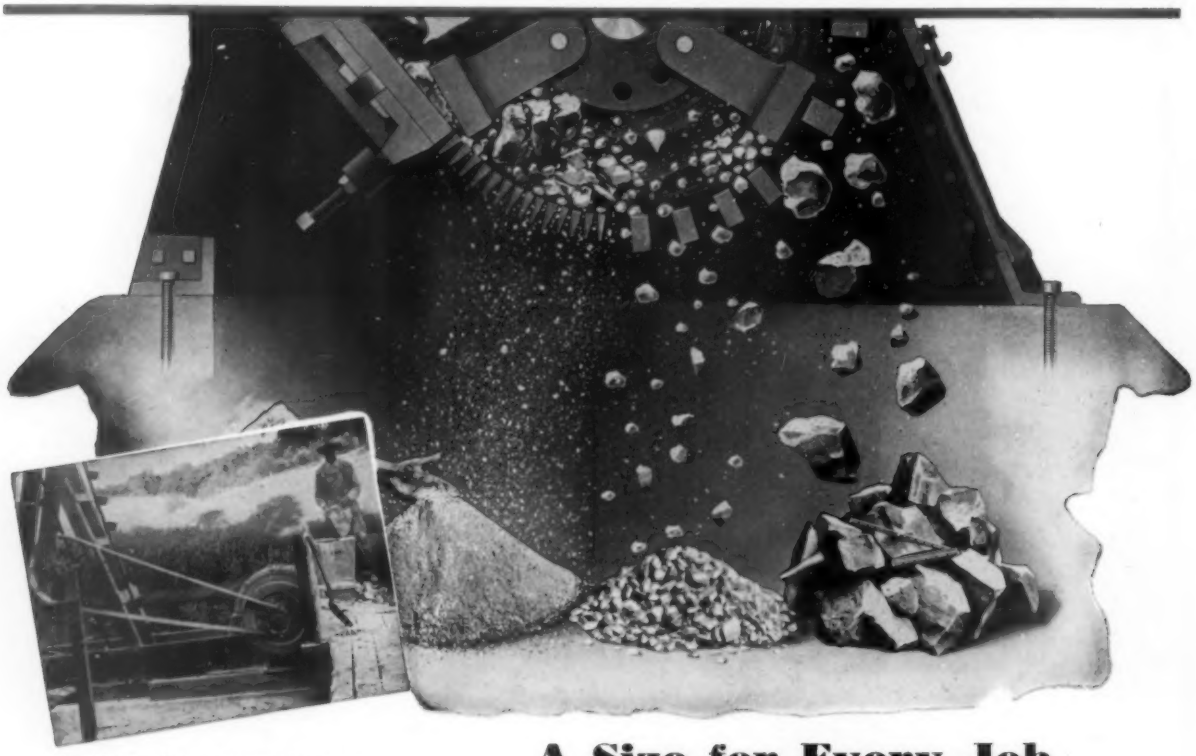
680
KRUPP MILLS
have been installed
throughout the world

In addition to rotary kilns and Unax Mills, Smidth supplies for the cludes a complete line of machinery, such as coolers, agitators, overhills, pumps, conveying equip etc., with accessories, for use in Cement, Lime and Ore

F. L. SMIDTH & CO.
225 BROADWAY Engineers NEW YORK, N. Y.

Williams Hammer Crushers

Handle Larger Rock • 50% Less Investment • Better Product



The "Jumbo Jr." which reduces "one-man" size limestone to 1", ¾" or agstone.

Feed opening of the "Mammoth" crusher which crushes 48" rock to 1" in one operation.

A Size for Every Job

The "Mammoth" crushes 48" rock to 3", 2" or 1" in one operation. Takes the place of a primary breaker and recrusher.

The "Jumbo" reduces 20" to 30" rock to 1¼" and smaller.

The "Slugger" crushes screen rejects or "one man" size rock to 1", ¾", ½" and finer.

The "NF" type is supreme as a recrusher for reducing 5" stone to 1", 1½" and agricultural limestone.

The "Non-Clog" for crushing wet muddy rock. Cannot be clogged.

FINE GRINDERS • AIR SEPARATORS • DRYER MILLS

The Williams Patent Crusher & Pulverizer Co.

800 St. Louis Ave., St. Louis, Mo.

Sales Agencies in All Principal Cities Including

CHICAGO 37 W. VAN BUREN ST. | NEW YORK 15 PARK ROW | SAN FRANCISCO 326 RIALTO BLDG.

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS MO. U.S.A. TRADE MARK

REG U.S. PAT OFF

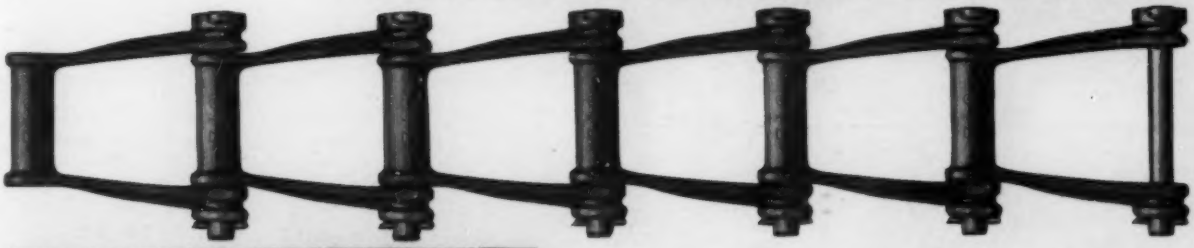
Williams

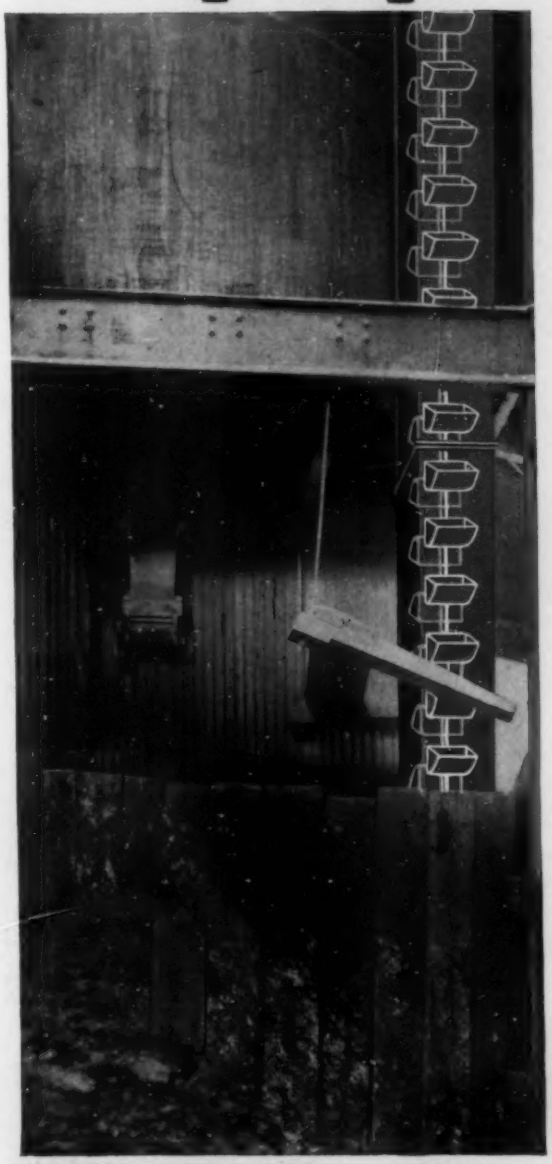
OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

Williams

PATENT CRUSHERS GRINDERS SHREDDERS

Received 5 Times More Service from PROMAL Chain





● This bucket elevator handled hot fuller's earth at the plant of the Fuller's Earth Co., Midway, Fla. The service was extremely severe. The malleable chain with which it was formerly equipped, usually had to be replaced about every 12 months.

In 1931 this elevator was equipped with Promal chain. It operated constantly in day-and-night service from that time until last October, when the plant was closed down. In the opinion of the management of this company, it still has many more years of service left in it.

For real economy, long life and durability, try Link-Belt Promal chains and buckets on your severe service elevators and conveyors.

Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, San Francisco, Toronto, or any of our other offices, located in principal cities.

7511

LINK-BELT PROMAL Chains and Buckets

NOV 16 1938
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Rock Products

With which has been consolidated the journals

CEMENT and ENGINEERING NEWS — Founded 1896

CONCRETE PRODUCTS — Est. 1918

Recognized the World Over as the Leader in Its Field

VOL. 41 CHICAGO, NOVEMBER, 1938 No. 11

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OWNED AND PUBLISHED BY
TRADEPRESS PUBLISHING CORPORATION

Publication Offices
205 WEST WACKER DRIVE, CHICAGO, ILL.
TELEPHONE—CENTRAL 0670

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Indexed in the Industrial Arts Index. Published Monthly. Subscription Price: United States and Possessions, Mexico, Cuba, Canada, $2.00; and $4.00 to foreign countries. Twenty-five cents for single copies.

To Subscribers—Date on envelope indicates issue with which your subscription expires. In writing to have address changed, give old as well as new address.

ROCK PRODUCTS
Bears the Twin Hall-Marks of Known Value

Impartial measurement of reader interest in terms of paid circulation

Authentic facts relating to editorial scope and readership analysis

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HAVE YOU *Investigated?* *The Brooks* LOAD LUGGER

PATENTED & PATENTS PENDING

CUTS HAULING AND DUMPING COSTS WHEREVER LOADING IS DONE BY HAND

FOR MANY TYPES OF SERVICE

One simple demonstration is sufficient to convince any prospect that the Brooks "Load-Lugger" is America's most effective machine for cutting hauling and dumping costs of any material loaded by hand. The "Load-Lugger's" adaptability to varied types of service is unlimited. For quarries . . . sewerage and road construction . . . excavating . . . concrete aggregate hauling . . . W. P. A. projects . . . snow removal and many other types of service, the Load-Lugger increases production, yet reduces equipment and operating costs.

One Brooks "Load-Lugger" and 5 to 10 Load-Lugger buckets may replace an equal number of trucks. It is ONE MAN operated from driver's seat . . . dumps automatically . . . requires no cables, sheaves, high pressure hydraulic hose, or tricky "gadgets" . . . all contributing factors to the "Load-Lugger's" economy and efficiency. Because of its special design, the Brooks "Load-Lugger" requires no counterweight on front of trucks, completely eliminating dead weight. The entire load is carried directly on the truck chassis. It can be installed on any truck chassis in a few hours. Built in 4 capacities. Write or wire now for fully illustrated literature. Demonstrations arranged in most sections.

BROOKS EQUIPMENT & MFG. CO.
62 DAVENPORT ROAD • KNOXVILLE, TENN.

(Top of Page) Dirt fill—handling dirt at .20 less per ton over other methods. (Top Above) Handling over 600 tons of rock per 8 hour day with 2 Load-Luggers and W.P.A. labor. (Circle) Passenger Transport Body Attachment accommodates 15 men. (Bottom) Fast removal of snow from city streets.

"NOTHING ELSE TRIED WAS ABLE TO WITHSTAND THIS *Heat!*"

(Left) Sand drying kiln in Dawes Silica Mining Plant, showing ring gear that Texaco Crater Compound keeps effectively lubricated.

(Below) General view of Dawes Silica Plant at Thomasville, Georgia . . . Texaco-lubricated throughout.

NEW! If you use rock drills and other air tools, you need this latest Texaco booklet. 36 pages on care and operation. Write for your copy.

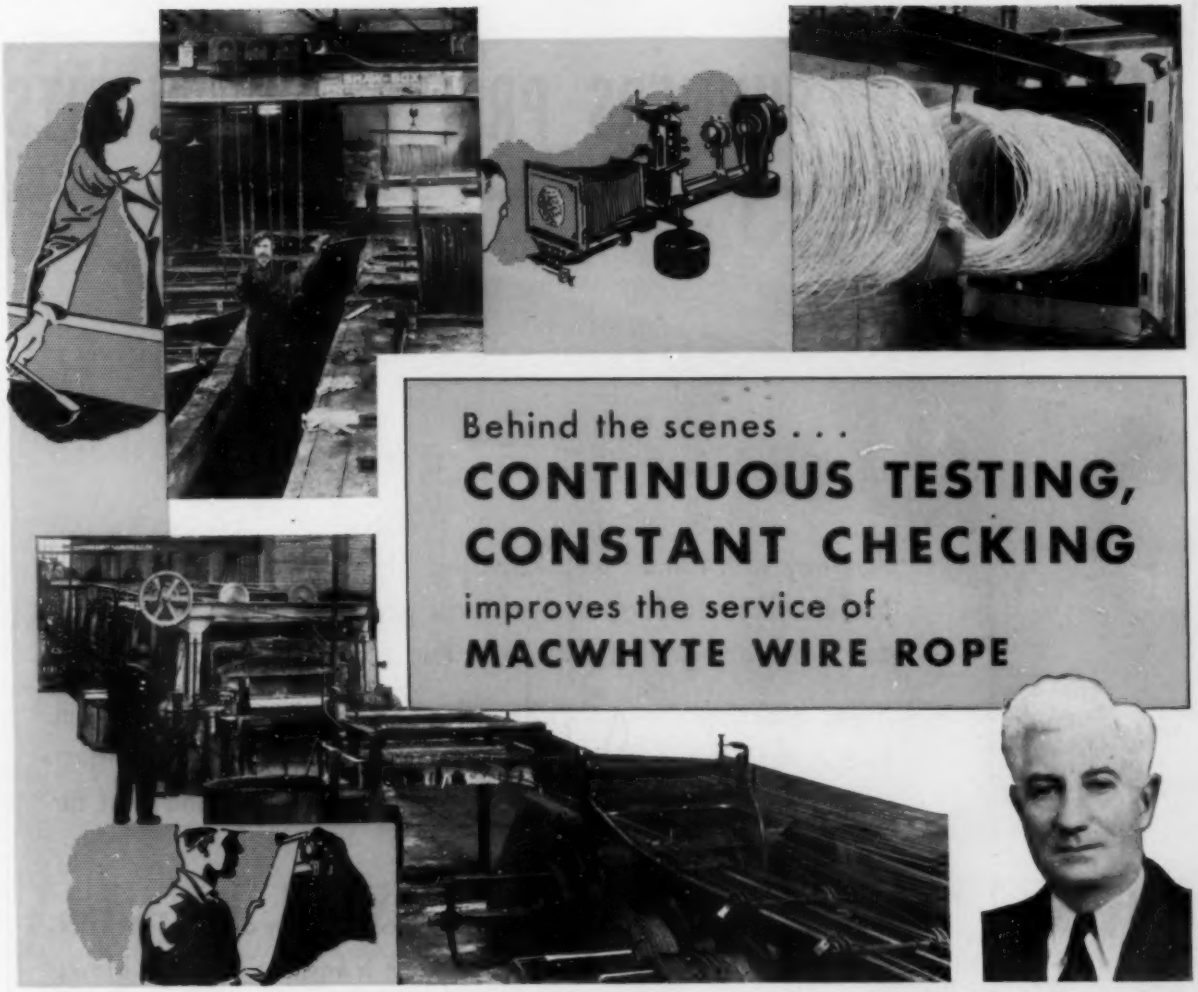
THIS IS THE REPORT on the Dawes Silica Mining Company, Thomasville, Georgia. It refers to the lubrication of the girth gears on their sand drying kilns.

After trying greases of various kinds, they tried Texaco Crater Compound and found it so completely satisfactory that they've used it exclusively ever since.

To help *you* solve *your* lubrication problems, trained lubrication engineers are available through 2186 warehouse plants. Call the nearest one, or write direct to The Texas Company, 135 East 42nd Street, N. Y. C.

Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment—Every Wednesday Night—Columbia Network—9:30 E.S.T., 8:30 C.S.T., 7:30 M.S.T., 6:30 P.S.T.

TEXACO *Crater Compound*



Behind the scenes . . .

CONTINUOUS TESTING, CONSTANT CHECKING

improves the service of

MACWHYTE WIRE ROPE

Mr. George Cudahy, Supt. of the Wire Mill, explains: "We work hand in hand with the laboratory. They help us and we help them. Together we make what we believe is the best wire you can find *anywhere*."

Remember . . . 'way back . . . when making wire rope was simply a matter of stranding several good lengths of wire?

Fortunately times have changed. Today making wire rope, as it's made at Macwhyte, is a scientific business.

Long Service Life built into Macwhyte rope

No matter what the operation . . . heat treating . . . pickling . . . wire drawing . . . at the Macwhyte mill metallurgists constantly check every step with the latest scientific equipment. Still later, Macwhyte engineers test and check the performance of the rope in the field.

This kind of supervision has proven time and again on the job, that longer service life and more economical operation *can* be built into wire rope.

Perhaps this is a reason why there are more users of Macwhyte PREformed and Regular Wire Rope today than ever before.

MACWHYTE COMPANY, KENOSHA, WISCONSIN

Manufacturers of wire rope and braided wire rope slings. Distributors and stock throughout the U. S. A. for quick service.

LOOK FOR THE

Whyte Strand

MACWHYTE WHYTE STRAND IS BETTER BECAUSE IT'S MADE BY SPECIALISTS

NO. 379

MACWHYTE

Whyte Strand - PREformed

THE WIRE ROPE WITH THE INTERNAL LUBRICATION

WHY DRILL RUNNERS PREFER TIMKEN BITS

Ask any drill runner who has used TIMKEN Rock Bits why he prefers them to forged steel. His answer will be: "Because I can get more drilling done with less effort."

If you question him further he will tell you that TIMKEN Bits drill faster; that they resist wear better and therefore last longer; that it is not necessary to change steels so often; and that he never has to wait for sharp steels.

The reasons are found in the streamlined design of the TIMKEN Bit, with the shoulder construction that transmits the drill blows evenly to the drilling edges; in the use of TIMKEN Electric Furnace Steel, a tougher and more efficient shock-resistant material; in the special deep-hardening process to which TIMKEN Bits are subjected; and the elimination of reforging.

The Pennsylvania's new Broadway Limited rolls on TIMKEN Bearings.
GLIDE—as you ride a Timken Bearing Equipped train

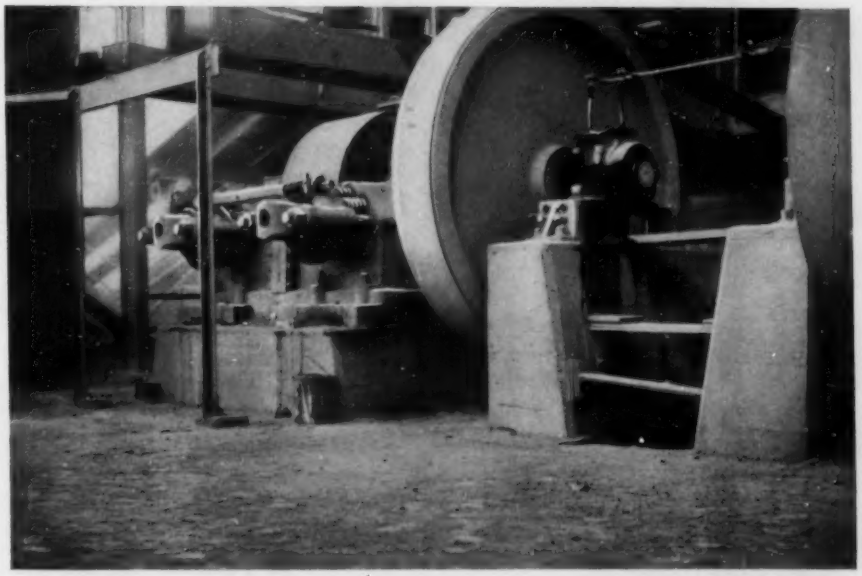
When you adopt TIMKEN Rock Bits you will save both time and money. It will pay you to get in touch with our nearest authorized distributor and arrange for a trial. Write for name and address.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
SERVICE-SALES DIVISION

TIMKEN
ROCK BITS

Convert Waste into Cold Cash - - -

Make agricultural lime from limestone screenings with



TRAYLOR
CRUSHING ROLLS

Crushing Rolls will produce fine ground material at a cost per ton much lower than any other method of crushing, if the feed is such as can be handled by rolls. For many years, a large number of different industries have profited by this fact.

Traylor Crushing Rolls, manufactured for more than thirty years, today comprise three different types in thirty-five sizes, ranging from 18" dia. x 10" face to 90" dia. x 24" face—lines that meet every requirement, and they are in use in practically every part of the world, handling most varieties of rock and ore.

Traylor Rolls will crush economically to as fine as 20 mesh, and thus are well adapted for the manufacture of agricultural limestone from otherwise worthless screenings.

It will pay any limestone operator to investigate this source of potential extra profits. We suggest that you send for our Bulletin 3627 today, or ask to have a representative call for a discussion of the subject.

WE BUILD

Rotary Kilns
Rotary Coolers
Rotary Dryers
Rotary Slakers
Scrubbers
Evaporators
Jaw Crushers
Gyratory Crushers
Reduction Crushers
Crushing Rolls
Grinding Mills
Ball Mills
Rod Mills
Tube Mills
Pug Mills
Wash Mills
Feeders
Rotary Screens
Elevators

Welded or Riveted Stacks, Tanks and Bins for any purpose.

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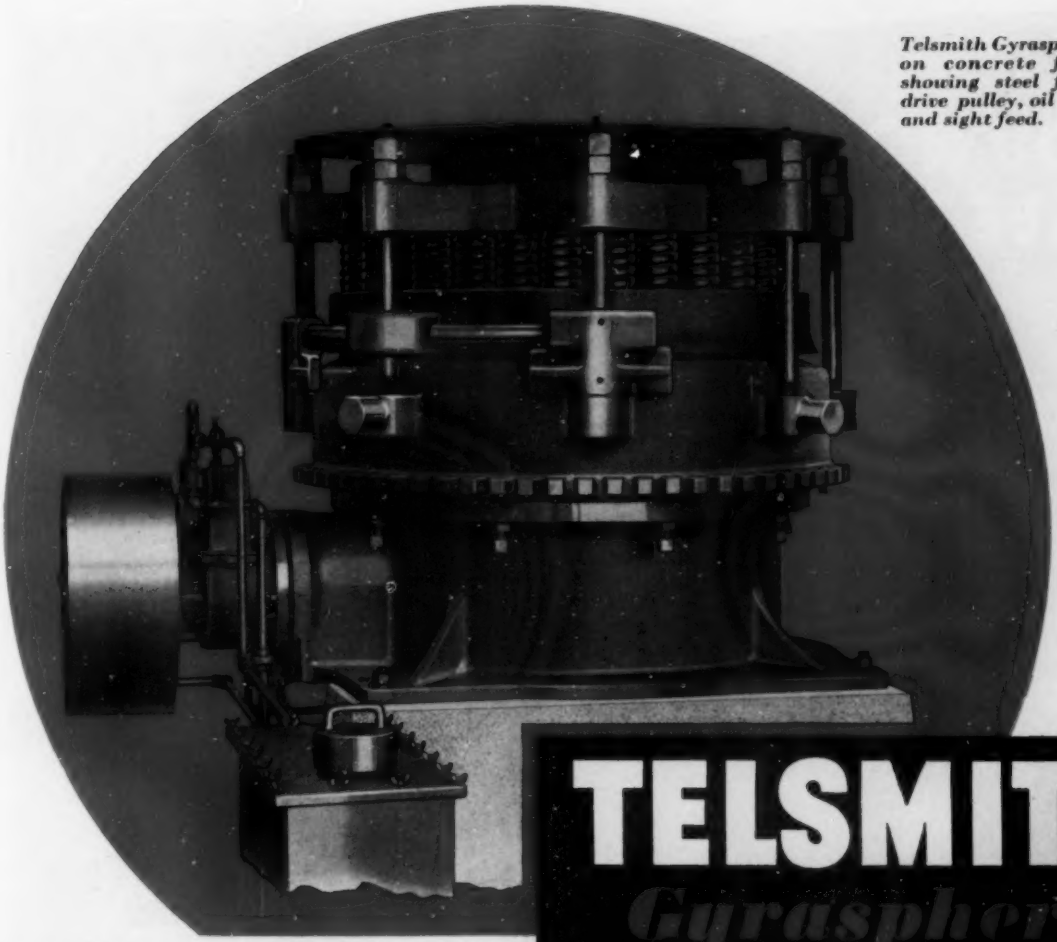
ELECTRIC
INFERNOS
BURN STEEL
SAMPLES
IN BUILDING WICKWIRE ROPE LIFE "BEYOND SPECIFICATIONS"
The carbon content of every pound of steel that goes into the wire for making wire rope, must be exact to produce the uniformly high degree of tensile strength, hardness and bending fatigue resistance that gives rope longer life. When testing for carbon in the Wickwire Spencer laboratories, the steel is burned in an atmosphere of oxygen. Resultant gases are segregated, captured, weighed and compared to find the percentage of carbon present. This is only one of the many painstaking and costly steps in producing Wickwire Spencer Wire Rope . . . beyond specifications. Official Specifications only set minimum physical standards. It is still the privilege of the progressive rope manufacturer to build life beyond specifications into his product.
WICKWIRE
ROPE
WICKWIRE SPENCER STEEL COMPANY
General Offices: 41 East 42nd Street, New York City; Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; Export Sales Department: New York City. WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Abilene, Texas, Portland, Seattle



Telsmith Gyrasphere Crusher on concrete foundation, showing steel feed hopper, drive pulley, oil tank, piping and sight feed.

TELSMITH *Gyrasphere* CRUSHERS

GREATER TONNAGE . . . . .
MORE CUBICAL PRODUCT . .
FINER CRUSHING . . . . . .

with less trouble . . . less power . . . less upkeep

Here's a secondary crusher that knows its job—and has what it takes to do it.

It's as simple as that. All *you* have to do *for* the Telsmith-Gyrasphere is to set it for the size you want—ranging from ⅜" to 1½" with standard concave; or ⅛" to ⅜" with special concave.

Then bring on your rock—and let your conscience be your guide—excess feed means nothing to this baby. The Gyrasphere *can* . . . and does take it! Yes, sir—an unlimited, unregulated choke feed. *That means tonnage!*

When it comes to crushing, the Gyrasphere doesn't "crack down" on the rock. It *thrusts up.* The spherical head and its corresponding concave are like an *inverted* mortar and pestle. Rock is caught between two multi-curved surfaces—and *cubed.* That means an improved product with fewer oversize slabs and splinters.

We could write a book about the Gyrasphere. We have, but it's brief, interesting and gives all the facts. Mailed without cost or obligation. *Ask for Bulletin Y-11.* YC-12

Associates in Canada: Canadian Vickers, Limited, Montreal and Vancouver

50 Church Street, New York City
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211 W. Wacker Drive, Chicago, Ill.
Abrams-Anderson Co., Detroit, Mich.
713 Commercial Trust Bldg., Philadelphia, Pa.
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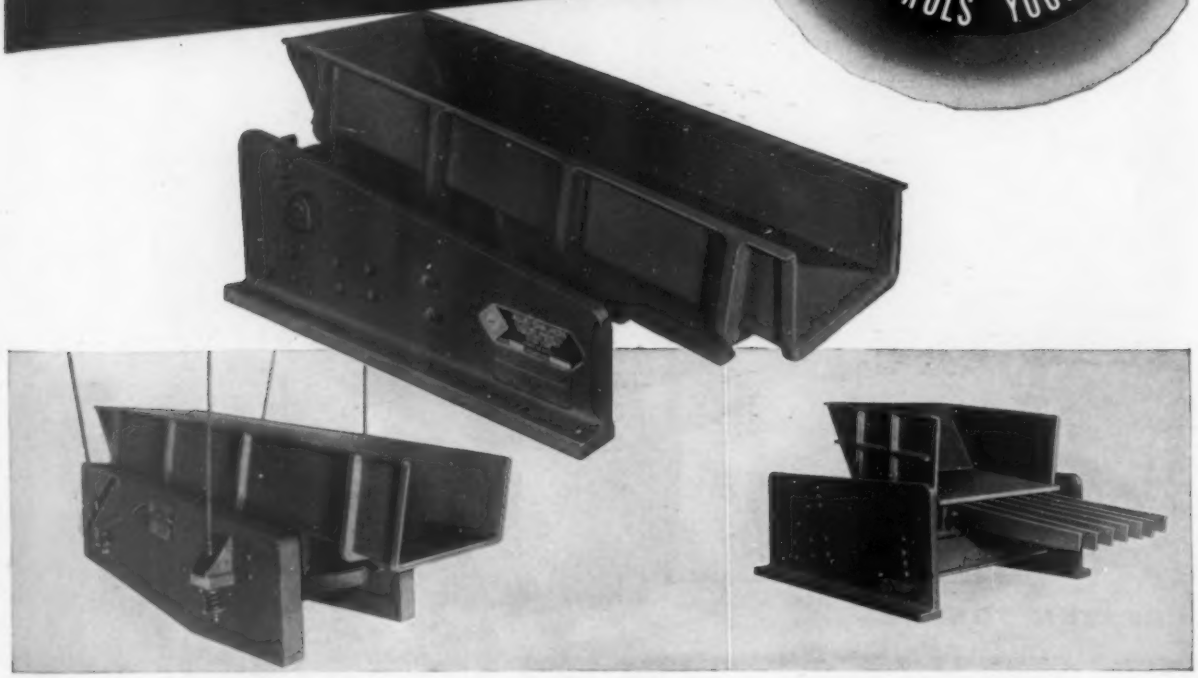
81 Binney St., Cambridge, Mass.
Brandeis M. & S. Co., Louisville, Ky.
412 Westinghouse Bldg., Pittsburgh, Pa.
Choctaw C. & M. Co., Memphis, Tenn.

SMITH ENGINEERING WORKS, 508 E. CAPITOL DRIVE, MILWAUKEE, WIS.

YOU NOW HAVE FULL CONTROL

A TURN OF A DIAL CONTROLS YOUR FEED



Yes, it is as simple as that. . . . With the new Utah Electro-Magnetic Feeders and Conveyors you can control the rate of feed to crushers, screens or processing machinery, instantly. A turn of the dial and the feed flows at the rate you need for most economical production. A slight turn slows it down, speeds it up, or shuts it off. You have absolute and immediate control.

The entire unit is simple, with no rotating or sliding parts . . . no bearings, nothing to lubricate . . . no motor-generator sets. The units are flame proof and ordinary dust has no effect whatever on the working parts. The vibrating motion is produced by a straight line reciprocating armature mounted between two pole pieces. One-half of an alternating current wave is sent to each pole, utilizing the whole wave and making the feeder double acting, and giving it remarkably low power consumption.

It will pay you to learn more about the feeder you can control. Drop a line to your nearest Allis-Chalmers office or the main plant at Milwaukee.

For fine sizing specify the Utah Electro-Magnetic Vibrating Screen. It is similar to the Utah Feeder in operation and principle.

885

CRUSHING · CEMENT AND MINING DIVISION

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

Precision
WIRE ROPE

"Precision" is easy to say but its accomplishment is something else.

Gilmore Wire Rope is precise to 1/1000 of an inch in wire and strand diameter as well as length of lay. And we know of no other Wire Rope that does that.

Besides this, its production is controlled from J & L mines to the completed product.

Gilmore Wire Rope, with a new plant and precision equipment and many years experience, backed by outstanding metallurgical science, should give you much longer and satisfactory service than any rope made, and thus save you money. Will you try it now? Send for catalog.

Other J & L Steel products:
Standard Pipe in seamless and welded—Seamless Steel Boiler Tubes—Hot Rolled Shapes—Abrasion Resisting Plates—Bar mill products including Bars for Concrete Reinforcement—Bar size shapes—Track Spikes—Wire Nails and Spikes—Galvanized Sheet Steel Roofing and Siding—Woven Wire Fencing—Barbed Wire—Soft Annealed Wire.

J&L STEEL

GILMORE WIRE ROPE DIVISION

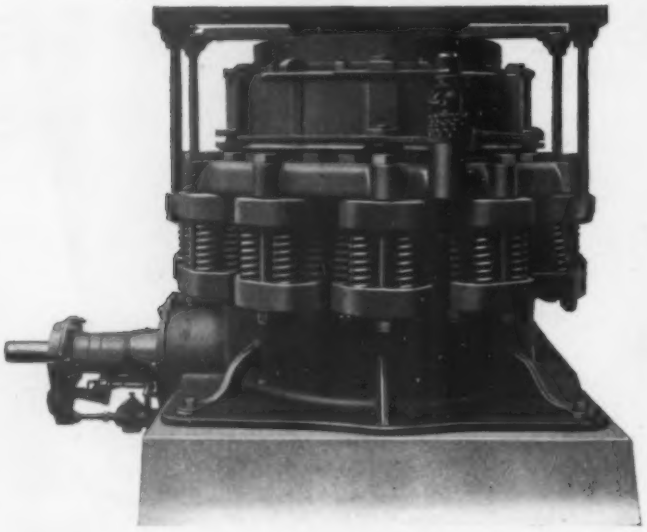
MUNCY · PENNSYLVANIA

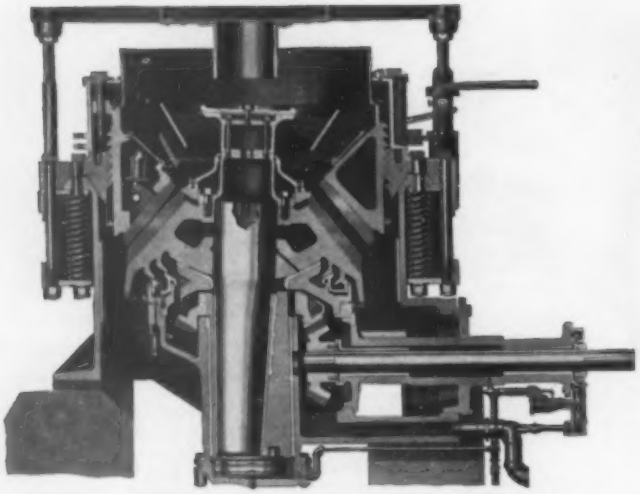
JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH · PENNSYLVANIA

These Six Important Features

Should be considered when fine crushing and big tonnage are involved





1 Unusual Crushing Process

Shape of crushing cavity, wide travel of head, and rapid gyration, give to the Symons Cone a process of crushing not found in any other crusher.

2 Great Capacity

Big tonnage maintained even at close setting.

3 Built For Long Life

Major castings of steel — renewable bronze bearings — circulating pressure system of lubrication — manganese crushing members — steel gears with cut teeth — weight of head and shaft and crushing reaction carried on spherical bearing.

4 Spring Protection

Heavy coil springs protect the crusher from tramp iron damage.

5 Size of Product Readily Changed

Bowl can be screwed up or down to change size of product.

6 Feed Evenly Distributed

Feed distributor on top of shaft mixes and distributes feed evenly around entire crushing cavity.

NORDBERG MFG. CO., MILWAUKEE WISCONSIN

NEW YORK	LOS ANGELES	TORONTO	LONDON
60 E. 42nd St.	Subway Term. Bldg.	Concourse Bldg.	Bush House

SYMONS CONE CRUSHERS

Removing Overburden—One of three L-O tractors and Continental scrapers used by L. A. Wood Company for stripping overburden and hauling barytes clay at Sweetwater, Tennessee.

FASTER POWER STRIPS DOWN 30 FEET

Much in demand for the manufacture of phonograph records, tooth powder and white paint is barytes, a heavy, whitish metal, mined by L. A. Wood Company at Sweetwater, Tennessee. There three Continental scrapers and the FASTER POWER of Allis-Chalmers tractors remove 30 feet of overburden and then transport much of the barytes-laden clay from pit to plant. Most of the time these outfits operate 24 hours a day over steep grades, do an economical job because:

1. They **DIG FASTER.** A-C's reserve power plus Continental's digging ability gouges out heaping loads quickly, even in tough, slaty materials that stop other units.

2. They haul **MORE LOADS FASTER.** A-C Oil Engines start instantly and go right to work—you gain from 1 to 3 loads per shift on starting time alone. More and higher working speeds give you a right speed for every need from lugging up steep pit ramps to high gear traveling on the level. Quick pick-up and easy handling save trip-gaining seconds getting into and out of the pit, swinging about on the dump.

3. They **UNLOAD FASTER.** Continental scrapers end dump like a truck, thus enable you to place overburden where you want it without a second handling.

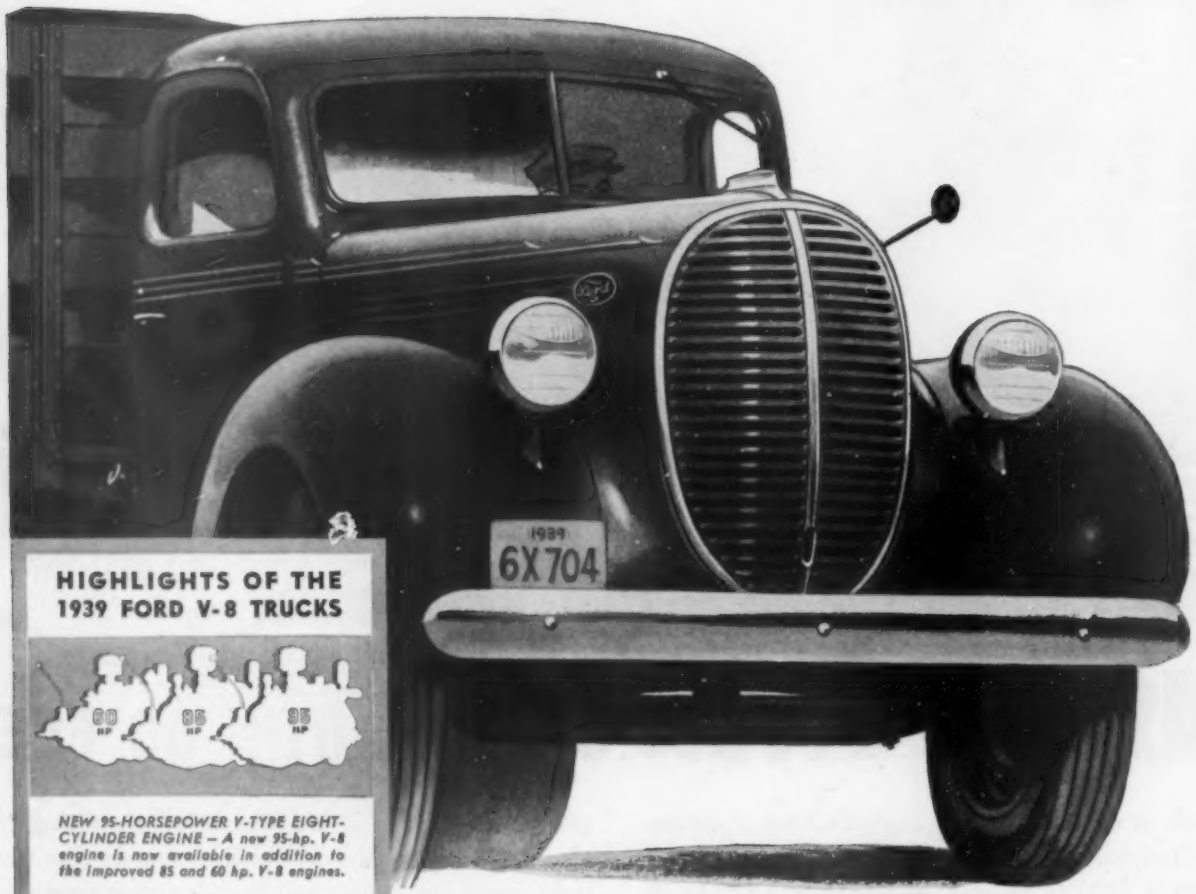
Ask your Allis-Chalmers dealer how this outfit can cut your stripping and material handling costs and at the same time take care of such other jobs as building hauling roads, digging drainage ditches, clearing slides, etc.

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled Ignition
OIL TRACTORS

THE TRUCK FOR THE JOBS OF 1939

FORD V·8



HIGHLIGHTS OF THE 1939 FORD V-8 TRUCKS

NEW 95-HORSEPOWER V-TYPE EIGHT-CYLINDER ENGINE – A new 95-hp. V-8 engine is now available in addition to the improved 85 and 60 hp. V-8 engines.

NEW HYDRAULIC BRAKES–Four-wheel hydraulic service brakes, built to Ford standards of safety, are regular equipment on all 1939 Ford Trucks.

- New-type piston rings for improved oil economy.
- All-steel cabs, insulated, ventilated and with Safety Glass throughout.
- 34-in. frame width standard on all units.
- Improved Semi-Centrifugal Clutch.
- Worm-and-roller steering.
- Full torque-tube drive.
- Straddle-mounted driving pinion – ring gear thrust plate.
- Full-floating rear axle.
- Factory-installed two-speed rear axle available at extra cost.
- Ford Engine and Parts Exchange Plan. Saves time. Saves money. Avoids long, costly layovers.

THIS YEAR Ford gives economy a new meaning—*over a wider range of truck operations* than ever before.

To the time-proved 85-hp. and 60-hp. V-8 engines is added the *new 95-hp. V-8 engine* for greater power and speed. It is available in the Regular and C. O. E. Trucks. There are *new hydraulic service brakes* for quick, straight-line stops, with easy pedal pressure. Along with these new features are those *time-tested* truck features that have set the high Ford standard of performance and reliability.

For 1939 there are 42 body and chassis types, with a choice of equipment including factory-installed two-speed rear axle, optional gear ratios, transmissions, clutches.

Ten billion miles of payload performance have proved the Ford V-8 engine and the rugged, dependable construction of Ford Truck chassis equal to the toughest jobs.

If you want to know why there are more Ford Trucks on the road than any other make, examine the Ford Truck. See the 1939 Ford V-8 units. Match them feature for feature with any other truck of comparable size and price. *Know the difference before you spend another truck dollar.*

Arrange through your Ford dealer for a new Ford V-8 Truck with which to make an actual "on-the-job" test.

FORD MOTOR COMPANY, MAKERS OF FORD V-8 CARS AND TRUCKS, MERCURY, LINCOLN-ZEPHYR AND LINCOLN MOTOR CARS

No Charge for its *SECOND LIFE*

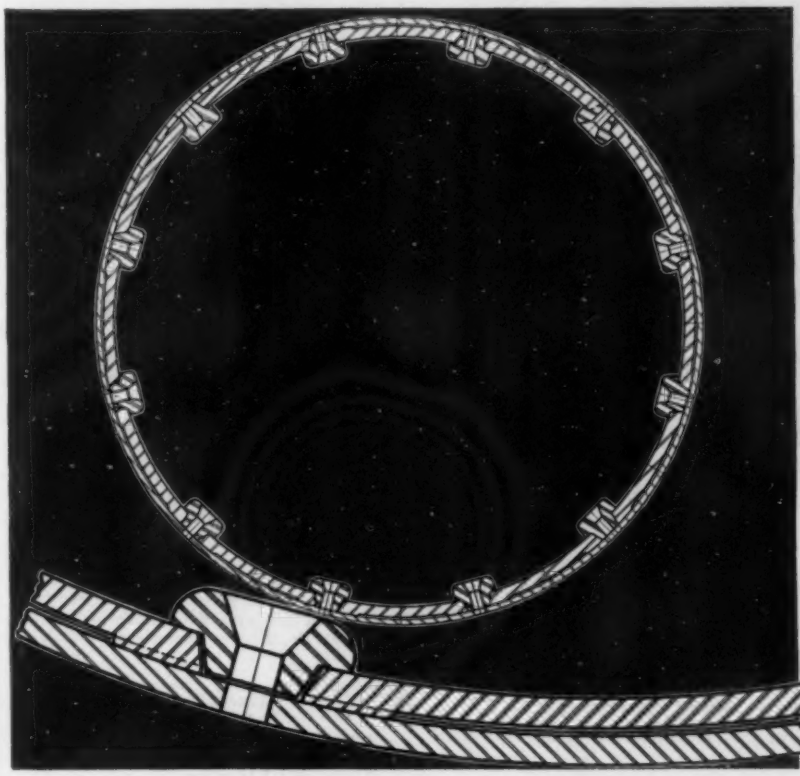
REVERSIBLE plates and bars give added life and renew lifting action—with no cost for new materials—when Lorain Rolled Steel Plate Lining is used in your mills. Not only does this lining resist abrasion and give long life (note picture of mill after 19 months' continuous action) but real savings are effected through Lorain's reversible feature.

The diagrams below show how Lorain Lining is designed to allow reversal of bars and plates. The lifting bars hold the high carbon rolled steel plate linings firmly in place. When lifting bars are worn from long service, grinding efficiency is quite naturally reduced. When ordinary linings reach this stage, they must be scrapped. With Lorain Lining, the simple reversal of the lifting bars renews lifting action. Service of this lining from here on is all profit.

This Lorain feature saves money. Replace worn-out linings in your grinding mills now with this efficient liner. The process is simple, requiring only the time of two men to make the change-over. Because of lighter weight materials, this job is not difficult.

The quality of rolled stock and the structural strength that Lorain Liners impart to the mill afford a reduction in the thickness of mill linings not otherwise obtainable. Such a reduction in lining thickness adds to the working diameter of the mill, thereby exacting either more output or greater fineness of the grind.

Our engineers will gladly work with you to suit design to your mills and grinding requirements.



THIS UNRETOUCHED PHOTO shows the condition of Lorain Lining after 19 months' continuous service in grinding cement slurry. Note how much lifting edge is still left — and remember that after further service, these bars can be reversed.

U·S·S LORAIN ROLLED STEEL PLATE LINING

CARNEGIE-ILLINOIS STEEL CORPORATION

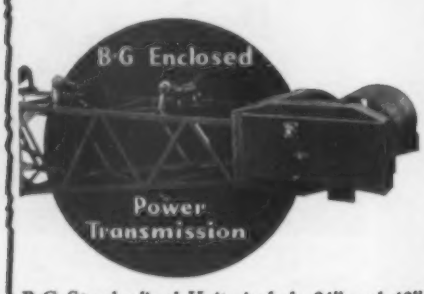
Lorain Division, *Johnstown, Pa.*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

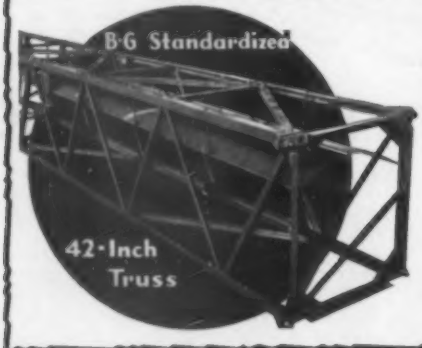
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Via Barber-Greenes



B-G Standardized Units include 24" and 42" deep Steel Truss, Enclosed Power Transmission, Head End Drives, Wrap Drives, Various Types of Take-Ups, A Frames, Walkways, etc. All unit parts and assemblies are accurately rated, giving the individuality of a "tailor made" conveyor plus the many additional advantages of standardization.



BELT conveyors offer by far the cheapest means of handling bulk materials. Barber-Greenes offer many additional advantages.

Having Pre-Engineered Standardized Unit Parts and Assemblies, the B-G Sales Engineer is able to make a quicker, more accurate price estimate, the Engineering Department is able to make a quicker, more practical lay-out.

This B-G Standardization lets us carry the parts in stock for practically any conveyor requirement — giving prompt shipment.

Erection is tremendously speeded up and simplified, and perfect alignment is assured.

B-G Standardization allows the addition of standard accessories later, and Barber-Greene Standardized Sectional Construction permits unequalled change of set-up to meet changing conditions.

B-G Carriers are recognized for their excellent design and performance records. They are available with plain, ball, or roller bearings. If you are replacing carriers or erecting your own conveyor, investigate B-G Carriers.

Solving your handling problems is our business.

Standardized Material-Handling Machines

BARBER GREENE

459 West Park Avenue
Aurora, Illinois

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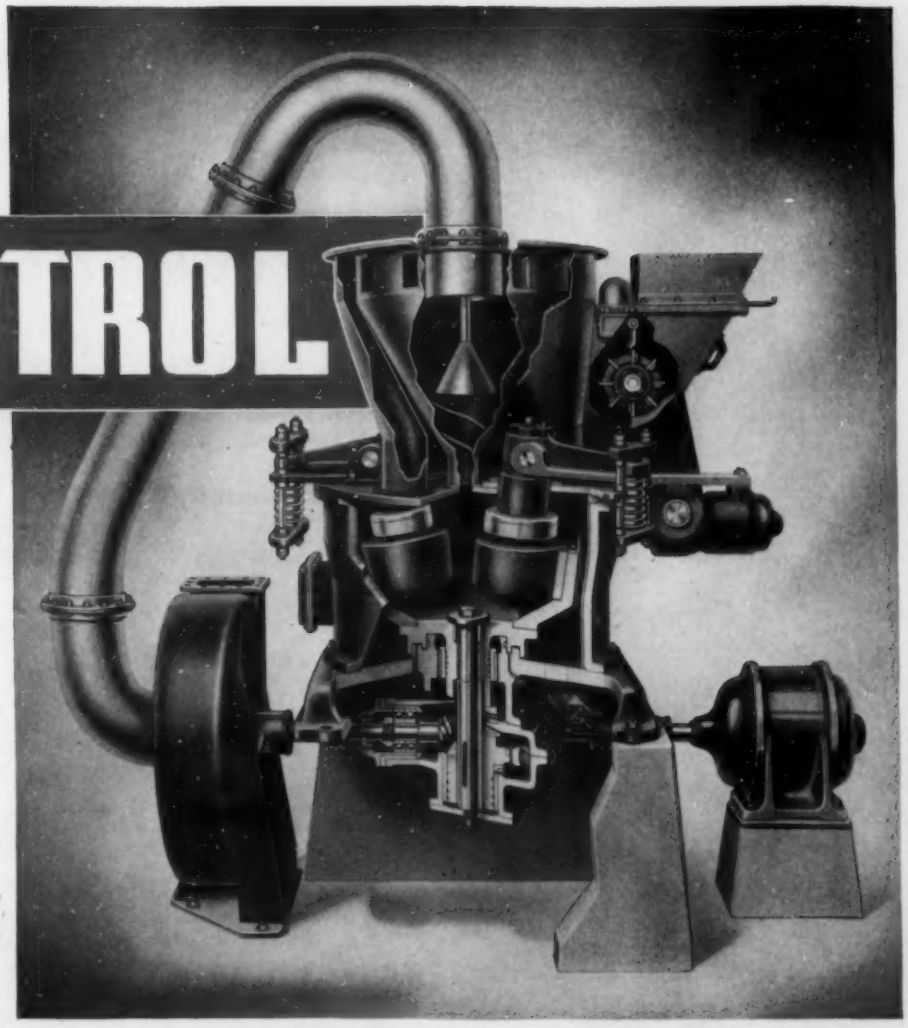
Easy CONTROL



ALL ADJUSTMENTS
made from outside while mill is running.

FINENESS CONTROL
by simple setting of separator vanes.

AIR-COAL MIXTURE
varied by easy damper adjustment.

PULVERIZING CAPACITY
governed by setting automatic feeder.

GRINDING PRESSURE
by regulating spring adjustment rods.

ROLL ALIGNMENT
saddle adjustment to compensate for wear.

RAYMOND
BOWL MILL

BOWL MILL FIRING

A user says: "The operation of the Bowl Mill is so simple that our man had no difficulty in mastering it."

The flexibility and adaptability of the Bowl Mill make it easy to maintain proper firing conditions and to handle any and all grades of coal regardless of the moisture content. The Bowl Mill responds so readily to changes in kiln demands that it is ideally suited for thermostatic temperature control and automatic feeder control.

The proved efficiency of Bowl Mill Firing is your assurance of a sharp drop in operating costs and a big increase in production when you equip your rotary kilns with this modern system.

RAYMOND PULVERIZER DIVISION
COMBUSTION ENGINEERING COMPANY, Inc.
1307 North Branch Street CHICAGO

Sales Offices in Principal Cities
Canada: Combustion Engineering Corp., Ltd., Montreal

Bowl Mills are Famous for their Record Low Power Costs

Announcement

Twenty-Second Annual Convention
NATIONAL CRUSHED STONE ASSOCIATION

In conjunction with which will be held

THE MANUFACTURERS' DIVISION EXPOSITION OF MACHINERY, EQUIPMENT, AND SUPPLIES

NETHERLAND PLAZA HOTEL
CINCINNATI, OHIO

JANUARY 30, 31 AND FEBRUARY 1, 1939

The Annual Convention of the National Crushed Stone Association, during the years since its inception, has become recognized as an event of outstanding significance to crushed stone producers individually and to the industry as a whole.

It serves, as no other medium can, to develop, crystalize, and express industry opinion. It signifies solidarity of purpose and the ablity of those engaged in the same line of activity to unite in the solution of common problems.

As individuals, producers will find much to reward them for a visit to Cincinnati. Speakers of outstanding reputation and experience will discuss problems of timely interest, both technical and legislative; opportunity will be afforded for the mutually beneficial exchange of opinions with fellow-producers, to say nothing of the pleasure to be derived from renewing old acquaintanceships; the Manufacturers' Division Exposition will command studious attention for the helpful suggestions to be obtained from an inspection of the latest developments and improvements in machinery and equipment used in the crushed stone industry.

All crushed stone producers of the United States and Canada, whether or not members of the National Crushed Stone Association, are cordially invited to attend our Twenty-second Annual Convention. Make your plans now to be present at Cincinnati on January 30, 31 and February 1, 1939.

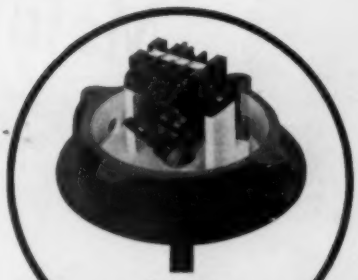
NATIONAL CRUSHED STONE ASSOCIATION

1735 FOURTEENTH STREET N. W. . . WASHINGTON, D. C.

Component equipment in your system must be right

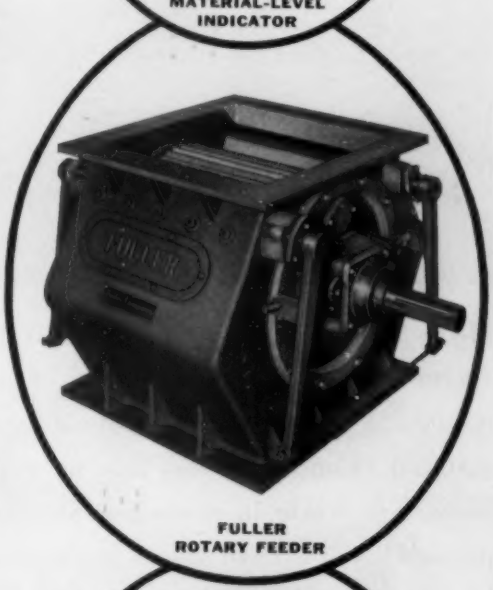
THE old saying, "A chain is only as strong as its weakest link", holds true in your plant, both as to equipment and method of operation. Your plant can only be as efficient as the component equipment that goes into it. Somewhere along the line there may be a weak link that is slowing up production, a link that might easily be strengthened.

The experience gained by Fuller engineers over many years has resulted in the production of much component equipment for handling pulverized or granular materials, a few of which are illustrated and described on this page.



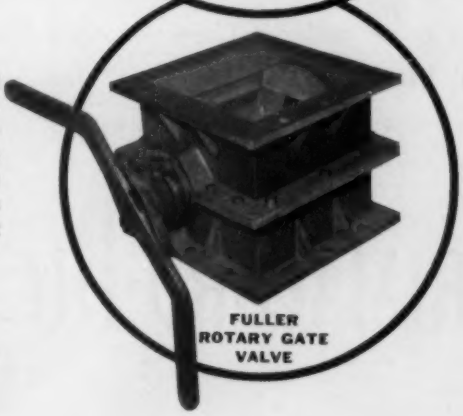
FULLER MATERIAL-LEVEL INDICATOR

FULLER MATERIAL-LEVEL INDICATOR: A device to control conveyor motors, valve circuits, etc., or give audible or visible warnings when the material reaches or falls below a predetermined level in a bin. This indicator is positive in operation. It will not make a false indication, neither (1) in the event of a momentary surge of material in the bin, nor (2) indicate a low level when an aerated pulverized material settles. One or more circuits such as signal, motor control, valve control, or the like, can be opened or closed by the same indicator. The necessity for relays has been eliminated, as the switches are positively held in the desired position when the material is above or below the predetermined level. The switches may be actuated instantly when the material level reaches the indicator or may, by adjustment, be delayed for any interval up to 10 seconds. As the interval between the time when rotation of the paddle is arrested and the switches are actuated is adjustable to provide a lag, the switch mechanism is not affected by a momentary surge of material against the paddle.



FULLER ROTARY FEEDER

FULLER ROTARY FEEDER: A feeder of consistent, volumetric accuracy for raw materials, pulverized coal, cement, lime, and many other applications in chemical plants. Close control of feeding is essential in almost any plant having such materials to handle. This feeder is of rugged and simple construction and has no metal-to-metal contacts. Available in sizes to meet all normal plant requirements, each size having a wide capacity range without loss of accuracy.



FULLER ROTARY GATE VALVE

FULLER ROTARY GATE VALVE: This valve is rapidly becoming standard equipment for material flow control from bins, silos, etc. Unrestricted opening permits free flow of materials which have a tendency to arch. Free movement of rotor to open and closed positions assured by careful machining and alignment of trunnion shafts in dust-tight bearings. No leakage in closed position, and rotor is built to avoid sticking. Built in sizes to accommodate normal plant requirements.

FULLER COMPANY

CATASAUQUA, PENNSYLVANIA

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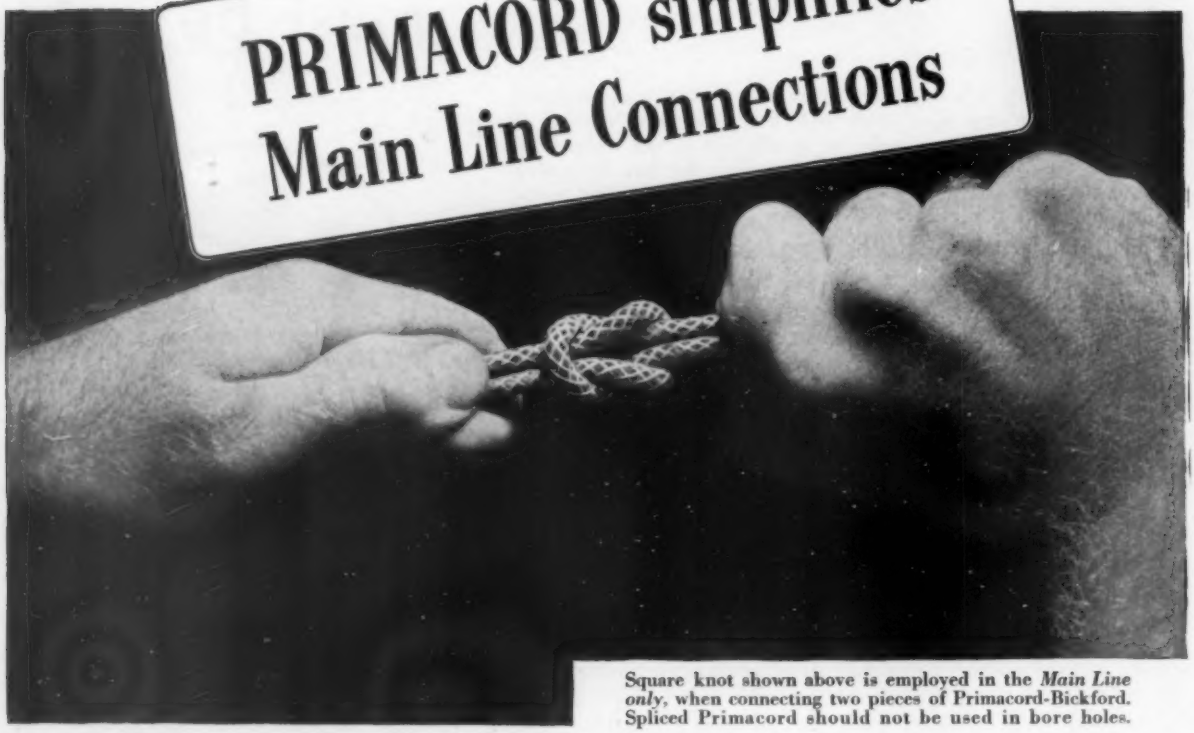
FULLER-KINYON, FLUXO, AND AIRVEYOR CONVEYING SYSTEMS · · · ROTARY FEEDERS AND DISCHARGE GATES
ROTARY AIR COMPRESSORS AND VACUUM PUMPS · · · AUTOMATIC BATCH WEIGHERS · · · BIN SIGNALS

PRIMACORD simplifies Main Line Connections



Square knot shown above is employed in the *Main Line only*, when connecting two pieces of Primacord-Bickford. Spliced Primacord should not be used in bore holes.

More work from explosives . . . better fragmentation . . . less moving of equipment . . . quicker removal of broken material. Would you also like to speed up operations while increasing safety and dependability . . . cut down expenses and bank more dollars? Then you need Primacord-Bickford, the improved detonating fuse for modern blasting, because it is . . .

INSENSITIVE to friction, fire, or ordinary shock.

PRACTICALLY INSTANTANEOUS, yet affords relief of burden.

EFFICIENT—gets maximum results from explosives.

ECONOMICAL in loading time and effort.

LIGHTWEIGHT—only 15 lbs. per 1000 ft.

EASY to handle and hook up.

Send for full details, contained in the free Primacord Booklet.

PRIMACORD-BICKFORD *Detonating Fuse*

THE ENSIGN-BICKFORD CO.
SIMSBURY, CONN.

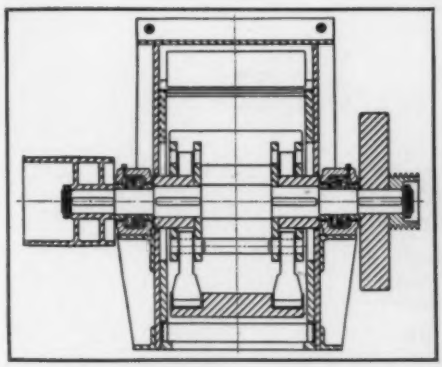
MAKERS OF CORDEAU-BICKFORD
DETONATING FUSE

PB2

SKF *Spherical Roller Bearings*

HELP CRUSH COSTS

on Lippmann Pulverators



Meeting vibration on the crusher of this Lippmann Pulverator is a hard job for any bearing. But it's work that makes it easy to prove the many advantages of SKF Spherical Roller Bearings.

BUILT BY LIPPMANN ENG. WORKS — SKF-EQUIPPED

Having high capacity, SKF Spherical Bearings take heavy shock loads from 60 h.p. input at 1,000 r.p.m. Mounted in semi-steel housings, they are efficiently sealed against dust and moisture. Adequate compensation is made for misalignment. Only occasional lubrication is needed.

Naturally, these factors play an outstanding role in the long uninterrupted service, increased capacity and low operating cost of *this* machine... *any* machine—anywhere. You make certain of good all-around bearing performance when you select SKF.

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SKF INDUSTRIES, INC., PHILA., PA.

SKF **BALL AND ROLLER BEARINGS**

42 TONS of kiln dust salvaged every day!

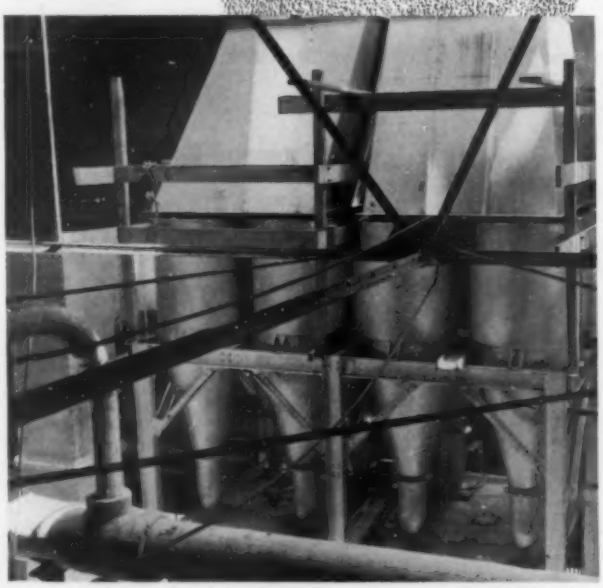
● THE plant of the Medusa Portland Cement Company at Wampum, Pennsylvania, averages 3200 barrels of cement a day. With the installation of Buell Dust Collectors, this plant salvages 26.8 pounds of kiln dust per barrel—a total of 85,576 pounds per day which formerly escaped from the stacks.

The Buell Collectors at the Medusa plant cost almost nothing to operate and maintain. They *will pay for themselves in less than a year.*

Results such as these can be accomplished for *you.* Employing the Van Tongeren system, with unique, patented features of design and operation, Buell Collectors bring you much higher efficiency than any ordinary cyclone collector. That efficiency is *pre*determined in the Buell testing laboratory and specifically guaranteed for *your* installation.

If *you* have a dust problem you will be interested in our *Bulletin D81.* It is clear, concise, informative—and free to any managing executive or operating engineer.

If you are interested in fly ash correction ask us to send *Booklet A80*



Compact dual unit of Buell Dust Collectors at Medusa's Wampum plant, each unit of four collectors serving one kiln

BUELL ENGINEERING COMPANY INC
SUITE 5000, 2 CEDAR STREET, NEW YORK

buell
DUST COLLECTORS

SALES OFFICES IN PRINCIPAL CITIES

ROCK PRODUCTS

Tax-Eaters and General Welfare

In their anxiety to understand and conform, executives in our industry, we trust, will not overlook the underlying philosophy of the federal wage and hour law. It is more significant than the provisions. For, in spite of many inconsistencies and contradictions in execution of details, the philosophy behind this and other pieces of legislation is consistent and persistent.

A succinct expression of this basic philosophy, by an economist of the Department of Agriculture is: "The government is a social institution, which means that like all other institutions it involves collective action in control of individual action. Theoretically, governmental policy is supposed to be motivated by the will to promote the general welfare, but at many points it has been controlled by various commercial and industrial groups for promotion of narrower interests. To offset some of these interests, effective action by labor unions, farm organizations, and consumer groups is indispensable to a balanced organization of government. Otherwise the government can not be truly democratic . . .".*

The theme is, therefore, to establish "true democracy" by a balance of economic powers—to offset alleged monopolistic money power of business by providing union labor with monopolistic power to fix wages and hours of work; by providing farmers with monopolistic power to control crops and fix prices. The "consumer group" is mentioned, but since members of all three groups constitute a majority of all consumers, whose selfish interests as members of their own group is assumed to be their motivation, it is silly to think of a consumer group apart; unless it be that rapidly growing army of government bureaucrats.

The place of the federal wage and hour law in this philosophy is apparent. It is designed to reinforce the Wagner labor relations act and strengthen labor unions in the smaller industries and plants where ordinarily the soil is not suitable for union growth. The Wagner law compels collective bargaining when asked for by employes; it gives the National Labor Relations Board merely the authority to say what group shall do the collective bargaining. The wage and hour law gives every single employe the power to make his employer's life so miserable that he will want collective bargaining as a way out —and collectivism is the keystone of New Deal philosophy.

As an example, the chief problem presented to our industry by the new wage and hour law appears to be the limitation of the work week, not at all feasible in a seasonal industry. If we understand the law correctly it does not compel a 44-hour week in such an industry; it specifically provides for collective bargaining through which employes at their own discretion can agree to work as many as 12 hours a day and 56 hours a week, without overtime, provided their total hours do not exceed 1000 in 26 weeks or 2000 in 52 weeks; which is an average of 40 hours a week for the entire year less a two-week's vacation—the real measure of work established.

Hence an operator can make a contract with his employes for say 200 days of 10 hours each to cover the actual working season. By careful planning he may probably provide for inclement weather and demand peaks in such a contract, especially if it is so drawn as to guarantee his employes 2000 hours of work a year.

Most commentators—in fact all that we have heard or read—assume that the law exempts only those employes now working under such contracts. We can't read that into the law, although it is indefinite, as in nearly every other provision. Our interpretation seems more logical in view of the preamble of the act, which gives as its purpose the elimination "of labor conditions detrimental to the maintenance of the minimum standard of living necessary for health, efficiency, and general well-being of workers."

One more point: "the general welfare," in this philosophy, is the welfare of all of us. It is *not* promoted collectively; it is promoted only by each of us taking care of our own welfare and of the welfare of those dependent upon us. One doesn't join a union or a farm organization to promote the general welfare. He joins it because he thinks by doing so he will promote his own welfare. He realizes what the economists do not, that "what is everybody's business is nobody's business." An enterpriser who develops a profitable business, or keeps a business profitable, and thus provides employment, even if he makes excessively selfish provision for his own welfare, is making a far greater contribution to the general welfare, than the bureaucratic critic who would not know how to meet a payroll. The general welfare is merely the summation of all our individual welfares.

Nathan C. Rockwood

*"Soils and Men," Yearbook, 1938, of the U. S. Department of Agriculture, p. 293.

Argentine Cement Plant Uses Flotation Process

On February 19, 1938, the first shipment of cement was made by the Argentine Portland Cement Co. from the new wet-process plant constructed on the banks of the Parana River about 200 miles north of Buenos Aires. This company, a subsidiary of the Lone Star Cement Corp., New York, N. Y., had studied the possibilities of manufacturing cement from this large deposit of limestone which was plainly visible from the Parana River and had long been used as a source of material for the production of lime. For many years, the economy of low cost water transportation and nearness to market of this deposit had intrigued the imagination of cement interests.

However, analysis of the deposit showed that the lime content was too low and the silica ratio too high for the manufacture of modern portland cement, and it was not until the Breerwood flotation process had been perfected that this material could be used. When research studies determined the practicability of this process in utilizing these deposits, the property was purchased in 1935. It is estimated that the entire deposit contains sufficient material for the manufacture of 50,000,000 bbl. of cement.

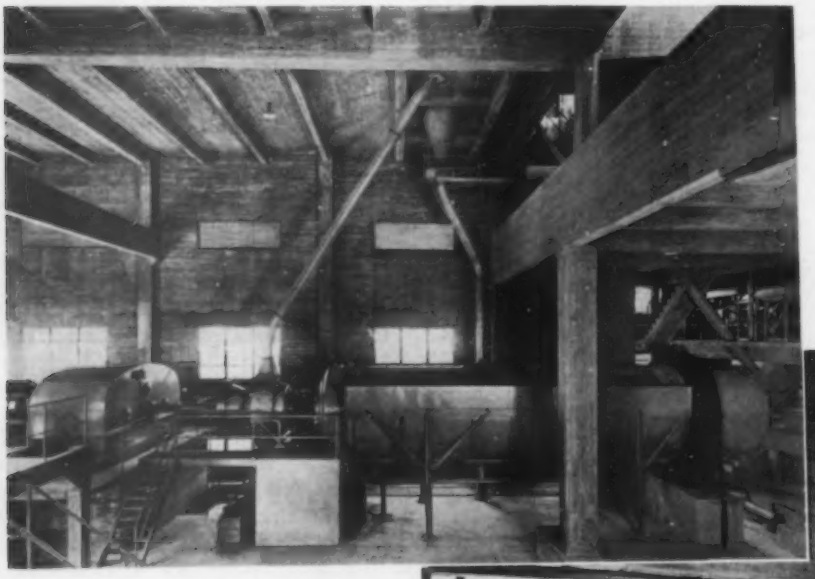
Many interesting engineering features were involved in the design and construction of the new plant. The raw material deposit consists of an almost horizontal layer of a conglomerate limestone, approximately 35 ft. thick, overlaid with 40 to 60 ft. of sandy clay. A dragline excavator, with a boom 200 ft. long and a 5-cu. yd. bucket, excavates this overburden and deposits it on the quarry floor, after the limestone has been removed.

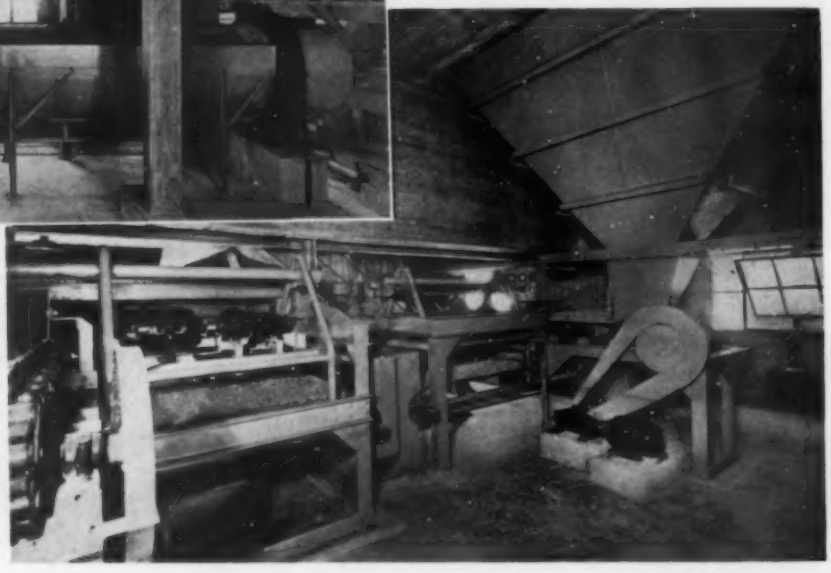
Loading and transporting the material takes place on top of the lime-bearing strata, after the overburden has been completely removed. Blast holes are drilled with the conventional type of well drilling machine, and a light charge of dynamite is sufficient to break up the rock so that it can be dug with a 3-cu. yd. bucket operated by a dragline with an 85-ft. boom, and loaded directly into 10-cu. yd. steel quarry cars.

Rock is hauled by steam locomotives over standard gauge track to the crushing plant, dumped into the large hopper of the roll crusher, and transported by a pan conveyor to a swing hammer mill secondary crusher that delivers the material, practically all minus ¾-in. mesh, to the rock storage.

Like all the other structures, the storage building for rock, clinker, and gypsum is of reinforced concrete. Materials are transported by an overhead crane, handling a 3-cu. yd. bucket, which has a span of 75 ft. An interesting feature of this building is the roof construction, consisting of a parabolic arch, 5 in. thick in the center and 12 in. at the eaves. Tension rods and the hanger rods are enclosed in concrete as a protection against corrosion.

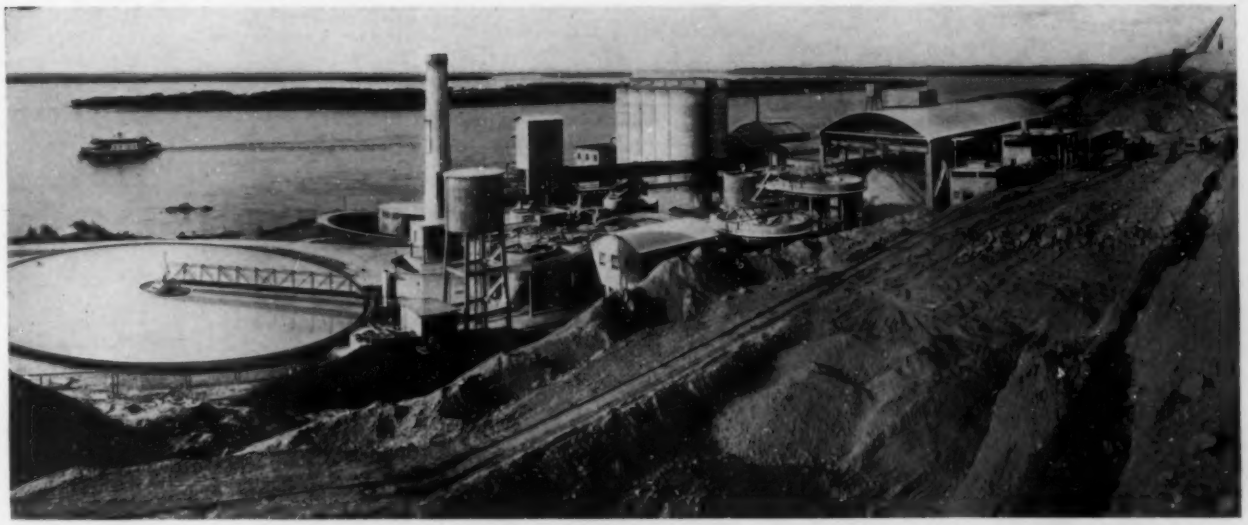
Raw material, segregated into high and low lime material, is delivered to the feeder bins for the ball mill in approximately the proper proportion to give an average mixture of the complete deposit as quarried, and then passes through a ball mill operating in closed circuit with the bowl classifier. The preliminary ground raw material is delivered into the storage tanks of the





Above: Interior of finish mill room showing air separator above

Right: Constant weight feeders for clinker and gypsum



General view of the new Argentine cement plant from quarry. Thickener tank is shown in the left foreground

flotation plant, the tanks being equipped with turbo mixers for keeping the material in suspension.

Slurry is then fed into hydro-separator No. 1, where the fines, consisting mostly of the clay minerals, are overflowed and go directly to the thickener. The underflow passes into hydro-separator No. 2, where further concentration takes place, and the underflow from this unit then goes to the cell house, having ten flotation cells.

Based on 1000 tons of original raw materials, the results in handling material through the cell house follows:

Feed to hydro-separators	998 tons
Fineness	88.95%-100 mesh
Solids in slurry	18%
Overflow from separators	354 tons
Cell feed	644 tons
Concentrates	401 tons
Rejects	243 tons
Thickener feed	755 tons
Fineness of slurry from thickener	80%-200 mesh

Tailings are pumped to the waste dump and the concentrate goes to the 180-ft. thickener for de-watering. The water is returned into the system and the final product from the underflow of this thickener, containing approximately 38 percent of water, is pumped into six correcting tanks. Each tank is analyzed and the mix withdrawn from the various tanks to give the correct chemical composition. It is then fed to a tube mill for a final grind and discharged from this mill at a fineness of 95 percent through 200 mesh, and delivered into two kiln mix basins equipped with revolving slurry agitators of Lone Star's own design.

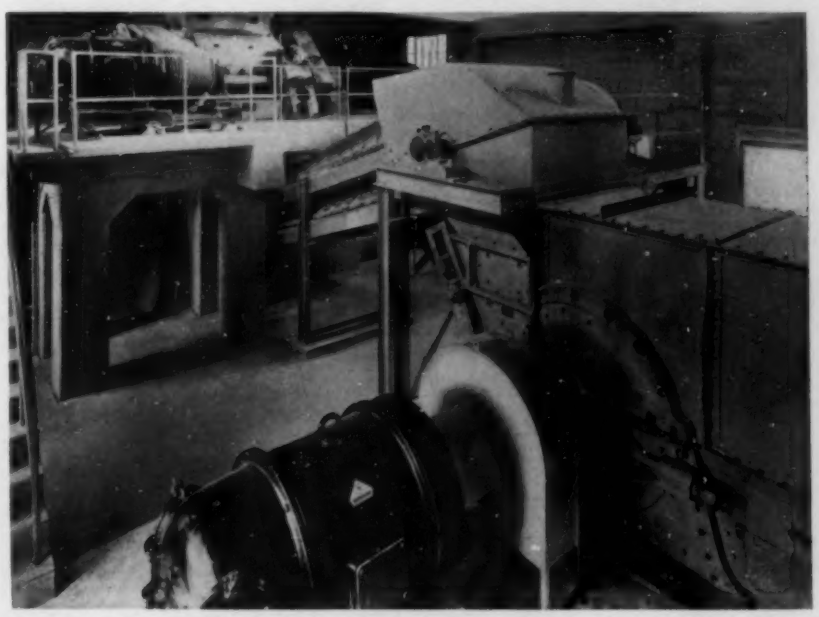
The slurry is elevated to the kiln feeder, arranged for constant level with overflow back to the mix basins; and the feeder, synchronized with the driving mechanism of the kiln, feeds the slurry into the kiln at a uniform rate per revolution at the quantity which the kiln can handle at best performance.

At the end of the kiln, a large dust settling chamber is provided. Dust from this chamber is handled by means of screw conveyors and an elevator back to the feeder floor, where it is fed into the kiln together with the slurry. An exhaust fan controlled from the burner floor discharges the gases into a concrete stack.

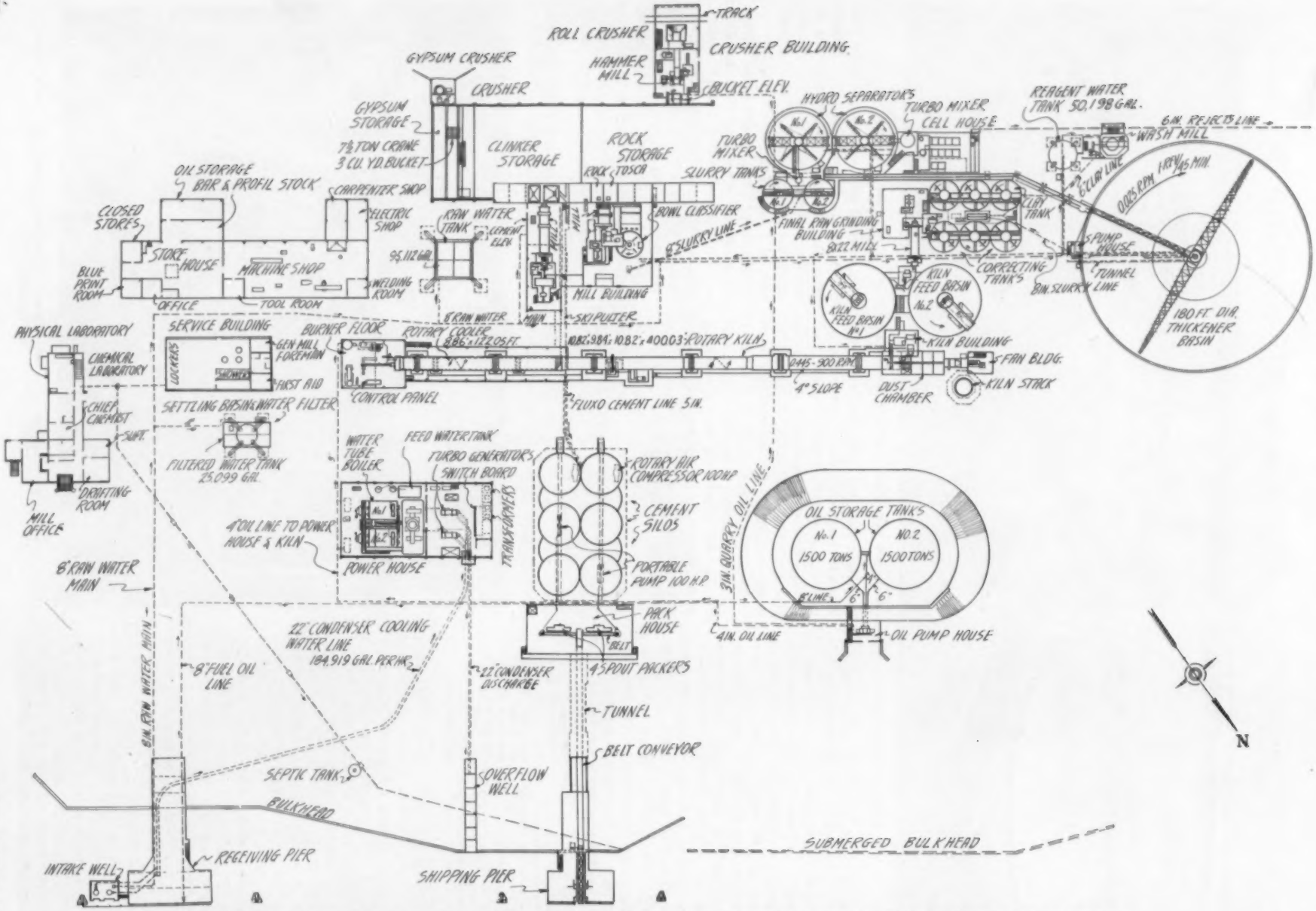
The kiln has a total length of 400 ft., the clinkering zone being 11 ft. in diameter and 115 ft. long; the calcining zone, 10 ft. in diameter and 155 ft. long, and the drying zone, 11 ft. in diameter and 130 ft. long. This kiln is similar in design to those at the Houston, Tex., plant of Lone Star, which are giving very efficient service. It is equipped with slurry drying chains, and under normal operation when the slurry contains 42 percent water, produces up to 3000 bbl. of clinker per day, with a fuel consumption of 1,000,000 B.t.u. per bbl.

Oil is used for fuel and large storage facilities are available. Fuel handling equipment, consisting of heaters, pumps, pressure fan, etc., is all located on the burner floor, where it can be under the direct supervision of the burner man. Instruments, showing the pressures, temperatures, speeds, etc., of the various points pertaining to the kiln, are located on a centralized control board on the burner floor.

Clinker is discharged from the kiln into a rotary cooler, and the cold clin-



Interior of crushing plant with swing hammer-mill in foreground and preliminary crusher in background



Complete plant drawing of new Argentine cement mill showing location of every important unit in the entire layout of equipment and buildings

ker conveyed on a reciprocating conveyor to an elevator which discharges into the clinker storage. Clinker and gypsum are handled by the overhead traveling crane into the feed bin above the tube mill, and is then fed into the mill by means of a Duplex constant weight feeder. The mill is 7.82 ft. in diameter by 39.37 ft. long, driven through a gear reducer by a 1050-hp. motor. A complete air separating system has been installed, but the mill is so arranged that it can operate in either open or closed circuit. Water-cooling of the mill is used primarily when operating in open circuit.

Finished cement is handled by a pneumatic conveying system into a warehouse consisting of six silos with a total capacity, including interspaces, of 125,000 bbl. Packing is done on four 4-spout packers, discharging to belt conveyors, which in turn deliver bags to a 42-in. belt conveyor that carries the bags to the end of the loading pier for transportation by water. Reversing the conveyors under the packers permits delivery to a platform for truck loading.

Power for the cement plant is generated in a power plant containing two boiler units, designed for normal capacity of 11.02 tons of steam per hour at 29 atmospheres absolute pressure, and at a steam temperature of 400 deg. C. Boilers are equipped with modern economizers and air preheaters, and are designed for oil burning with an efficiency of 86 percent at normal load. Generating equipment consists of two turbo-generators of the radial flow, double-rotating type. Each unit is rated at 2500 kw., and is equipped with modern auxiliaries for effective control and economic operation. Under normal conditions, this station produces a kw. hr. on the switchboard with approximately 18,000 B.t.u.

Minerals Separation Process

Although several other new cement mills are now utilizing the Breerwood process, this was the first plant specifically designed to take full advantage of its possibilities, unhampered by the limitations of existing equipment and its arrangement. The entire raw material flow-sheet, from the quarry to the kiln feed tanks, presents an unusual and ingenious combination of grinding and minerals separation methods, and equipment, appropriate to the materials available at the plant site.

After almost a year of successful operation, without substantial incident, the principal results, and the conclusions that can be drawn from them, can be summarized briefly as follows:

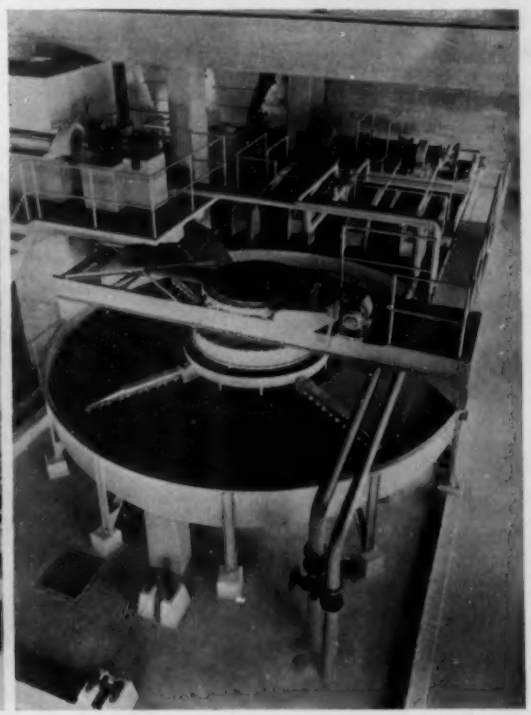
Cements of high quality and strength characteristics and of extraordinary uniformity have been produced with this process from compositions derived solely from a deposit which otherwise would have been impossible. The provisions for relatively simple adjustments in the operation of the plant make it possible to vary the ratios and moduli for the production of all known types of cement, including those which would satisfy the most rigid specifications for sulphate-resisting cements. The processing method reduces both soluble and insoluble alkalies, the clinker produced being almost entirely free of alkali. By recovering substantially all of the available lime and the useful proportions and varieties of clay minerals, the process assures the plant of a practically inexhaustible supply of raw material. The combination of the grinding and minerals separation methods has resulted in a corrected kiln feed averaging about 90 percent minus 325 mesh, this high fineness resulting in a composition free from segregation and of excellent burning characteristics. This high fineness is reached economically by eliminating the excessive proportion of coarse quartz prior to final grinding of the necessary minerals, reducing thereby the total power consumption of the two mills to a minimum. The clinker is hard-burned but is easily ground, a characteristic at least partly attributable to the uniformity of the composition and its fineness.

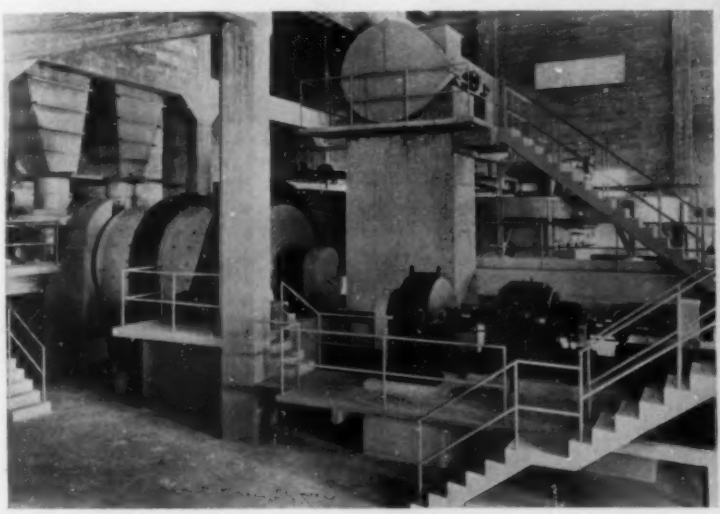
Quarry Operations

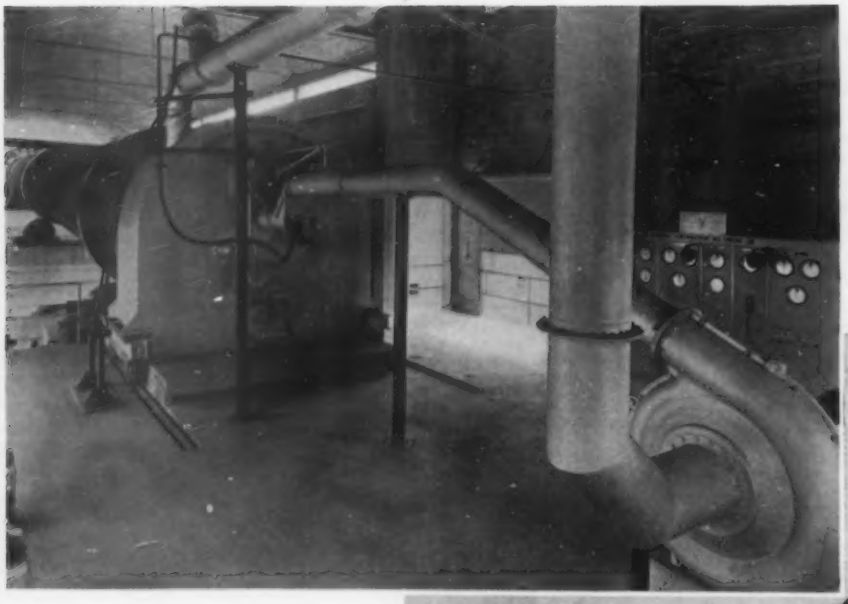
The entire raw material supply is adjacent to the plant and may be described as a consolidated marl, the two principal strata being quite hard, with the lowermost distinctly recrystallized. The four major horizontal strata are in the order of overburden, clay, a soft, lime-bearing material known locally as soft Tosca, a somewhat harder strata of similar material, known as hard Tosca and a crystalline limestone known as Piedra. The present development and the method of working are illustrated schematically in Fig. 1. The average analysis of the strata is about as follows:

Right: Bowl classifier in the raw mill room

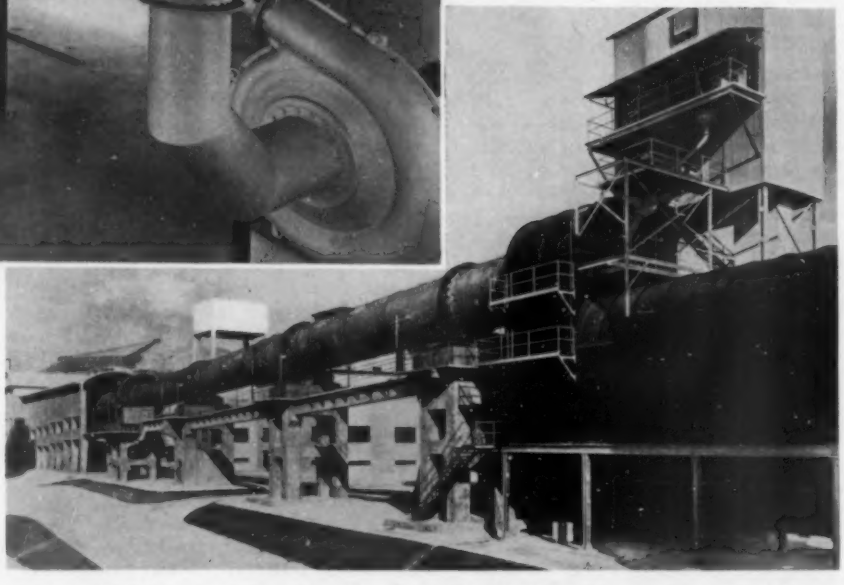
Below: Interior of raw mill room showing ball mill in the foreground and bowl classifier in the background







Below: View of 400-ft. kiln from the feed end with the dust chamber in the foreground



Above: Burner platform of oil-fired kiln with central electrical control panel shown at right

The necessity for employing a minerals separation method to correct the chemical composition of each of these

	Overburden Clay	Soft Tosca	Hard Tosca	Piedra
SiO_2	68.08	66.30	19.43	9.68
R_2O_3	20.20	17.72	4.16	0.84
$CaCO_3$	2.70	5.17	71.90	89.30
$MgCO_3$	....	1.75	4.34	2.61
Ratio	3.31	3.74	4.68	11.52

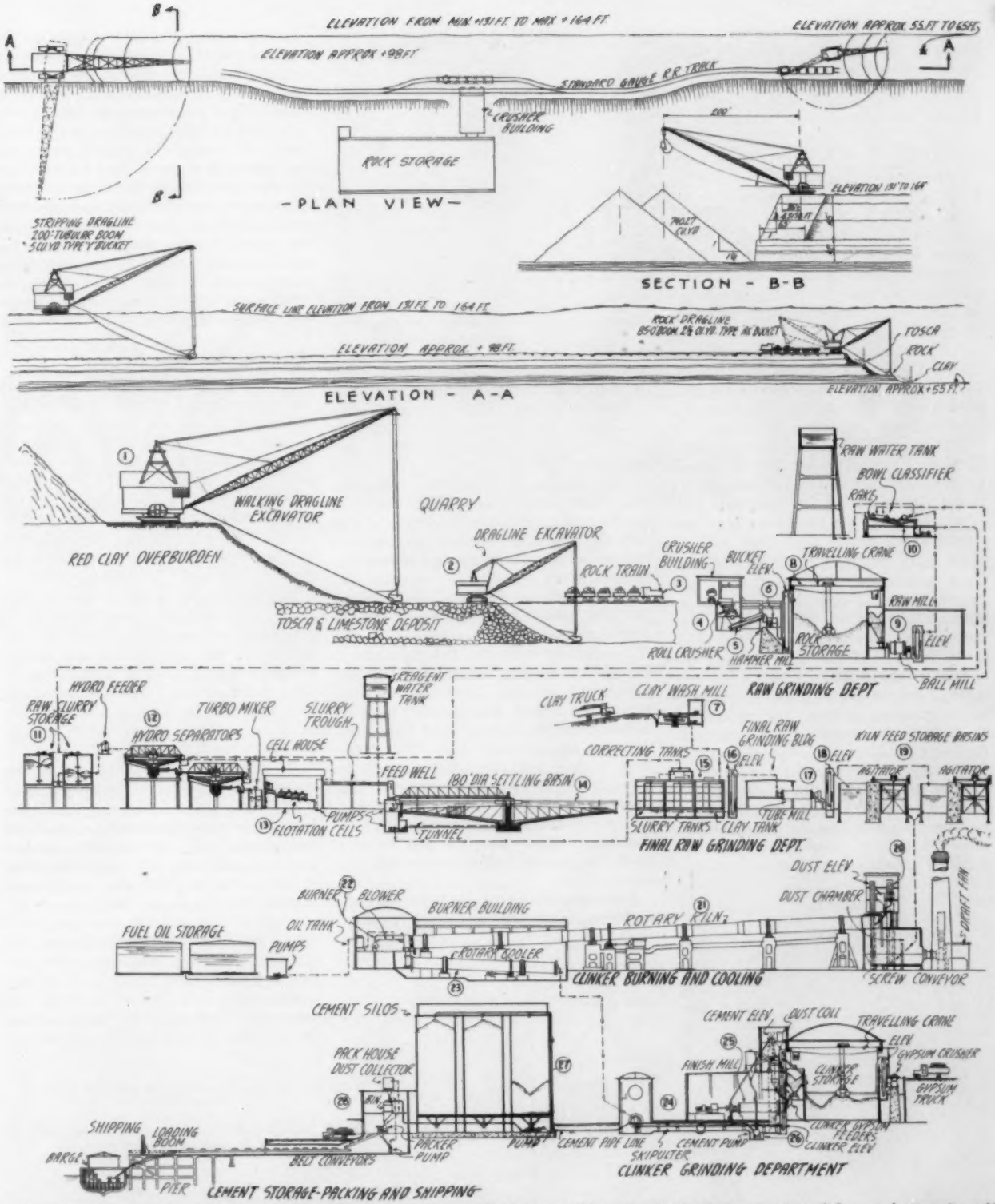
strata or any combination of them will be evident. The Piedra or hard limestone is higher in lime than required, but contains practically no iron and alumina. The silica content is misleading as it occurs mostly as coarse quartz and is therefore undesirable as a constituent of the mixture; the other lime stratum, the hard Tosca, is too low in lime and considerably excessive in silica, the SiO_2/R_2O_3 ratio being 4.68, a large proportion of the silica being in the form of coarse quartz grains. The soft Tosca, which is used as the source of clay minerals, must be corrected by subtracting a part of the silica, since its natural SiO_2/R_2O_3 ratio is 3.74. Even the overburden clay could readily be used if a small proportion of the silica were removed.

The present method of quarrying the material comprises stripping and discarding all of the overburden clay and about half of the soft Tosca, the remainder of the deposit being utilized. To simplify the operation of the process plant and to avoid frequent adjustment of the units, two cuts are made, the useful part of the soft Tosca together with the hard Tosca being sent to storage and kept in a pile separate from the Piedra. From these two piles, the materials are delivered by the crane to two bins above the ball mill and are proportioned by separate feeders in direct relation to the thickness of the strata, a relatively uniform material mixture being sent to the process plant, averaging about as follows:

Discharge end of clinker cooler

SiO_2	28.70
Fe_2O_3	2.57
Al_2O_3	4.01
CaO	33.35
$CaCO_3$	59.50
MgO	1.25
Loss	29.69
Total	99.55
SiO_2/R_2O_3	4.36

Petrographic examinations of the materials, which comprised an essential part of the preliminary minerals separation investigations, identified the principal component minerals as calcite, quartz, aluminum silicates, limonite and dolomite. The aluminum silicates comprise the alkali feldspars, soda plagioclase (albite) and potash feldspar (microcline) and hydrous aluminum silicates of indeterminate composition approaching clay minerals and ranging in size from one to several microns. Accordingly, the mineralogical equivalent of the above analysis is approximately as given on page 30.



Elevation flow sheet of entire cement plant and quarry. 1. Bucyrus-Monighan walking electric dragline excavator of 5 cu. yd. capacity with 200 ft. boom. 2. Dragline excavator, 85-ft. boom, for rock. 3. Dump cars, each of 10 cu. yd. capacity. 4. Fairmont crusher, Texrope drive, with a capacity of 200 ton per hr. 5. Pan conveyor, 48-in. 6. Dixie hammermill with moving breaker plate, capacity 200 ton per hr. 7. Clay wash mill with a capacity of 15 ton per hr. 8. Rock and clinker storage with 7½-ton crane and 3-cu. yd. clamshell bucket. 9. Ball mill of 50 ton per hr. capacity. 10. Bowl classifier and slurry pump with capacity of 860 g.p.m. 11. Two raw slurry storage tanks with turbo agitators and slurry pump of 1000 g.p.m. capacity. 12. Two hydro-separators, 45 ft. in diameter, with 1000-ton per day capacity. 13. Ten 56-in. flotation cells, 700 ton dry material total capacity. 14. 180-ft. diameter thickener handles 790 ton of rock per day. 15. Five slurry correcting tanks. 16. Slurry elevator with center discharge. 17. Unidan mill with capacity of 300 bbl. per hr. 18. Slurry elevator to kiln feed basins. 19. Kiln feed basins, 5000 bbl. capacity. 20. Kiln feed elevator to rotary kiln. 21. Rotary kiln with 100 bbl. per hr. capacity. 22. Oil burner and auxiliary equipment. 23. Rotary cooler, 9- x 120-ft. 24. 16-in. Skipulter. 25. Unidan mill of 130 bbl. per hr. capacity. 26. Cement pump. 27. Cement storage, 124,000 bbl. 28. Packhouse equipped with four Bates 4-spout packing machines

A thorough preliminary investigation of these materials was made to determine whether or not they would respond satisfactorily to minerals separa-

Quartz	24.40
Limonite	3.14
Aluminum Silicates	9.78
Calcite	59.75
Dolomite	3.01
	100.08

tion methods, before the plant site was finally selected. The principal test work comprised determinations of grinding, classification and thickening characteristics together with investigations of the amenability of each of the materials, and their fractions according to particle size and mixtures of them to froth flotation concentration. The test data served as the basis in designing the flow diagram and for the selection of the various units of the process plant. This work was done by the laboratory of the Separation Process Co., Catasauqua, Penn., with the coöperation of laboratories of the Dorr Co., Inc., and American Cyanamid Co.

To make the essential corrections of these materials, the objective of the process plant is principally to recover substantially all of the calcium carbonate and the useful fine clay minerals, but to subtract and discard the excessive proportion of silica in the form of coarse quartz grains, and without attempting to grind the latter, and to control the proportion of alumina for the production of low-heat and sulphate-resisting cements.

Prior to storage, the materials are crushed to minus ¾ in. ring in a roll and hammermill, and stored in the two piles described above. Preliminary grinding of the proportioned materials

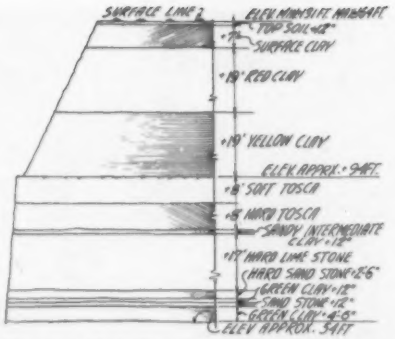


Fig. 1: Schematic elevation of the quarry, showing the principal strata and method of working

is accomplished in a single 9-ft. x 11 ft. 6-in. ball mill in closed circuit with a bowl classifier. This operation differs from usual preliminary grinding since it is the purpose to reduce the materials only to a degree at which the coarse quartz is physically released, whereby it may be subtracted from the calcite and useful clay minerals in the flotation operation. Mineral bond breakage is complete at 85 percent minus 100 mesh, further grinding at this point being undesirable as it would involve waste of power and otherwise increase operating costs.

A brief reference to the flow sheet, Fig. 2, and a plan illustrating the arrangement of the principal units of equipment, Fig. 3, will simplify the description of the functions of individual units of the process plant. The overflow of the bowl classifier is sent to 23- x 23-ft. turbo-mixers, shown in the plan, which act as slurry storage tanks and surge tanks to keep the solids in suspension until they are fed to two 45-ft. hydro-separators connected in series.

Substantially all of the fine calcium carbonate and the necessary proportions of the fine clay minerals are recovered as the overflow of the two hydro-separators. The underflow from the second hydro-separator is largely calcite and coarse quartz, evidently of sea sand origin, and is fed to the flotation cells where the quartz is rejected and pumped to waste. The calcium carbonate concentrate is fed to a 180-ft. thickener where it joins the fine calcium carbonate and clay minerals, i.e., the overflow from the hydro-separators. The mixture, after being de-watered and ground in open circuit to proper fineness in a 7- x 26-ft. tube mill, constitutes the kiln feed.

Hydro-Separation Process

As the proportion of alumina in the natural materials is reduced in the normal operation of the process plant and as there are substantially no undesirable minerals, other than the excessive proportion of coarse quartz, which occurs widely distributed throughout the deposit, including the clay, the removal of the coarse quartz and the reduction of the silica ratio constitutes the principal function of the flotation cells.

Elutriation and analysis showed that there were sufficient clay minerals in the quarried material, and that the clay itself was not suitable for cement making, unless a large proportion of silica was removed. The simplest plan, therefore, was to combine the materials prior to preliminary grinding, and to follow this with a series hydro-separator operation, to provide for satisfactory and efficient classification.

Control of the hydro-separator operation was determined to be the most economical and satisfactory method both for recovering the fine constituents of all useful minerals, and for proportioning their tonnage, relatively to the tonnage of the coarser fractions from which the quartz is subtracted by the flotation operation. Similarly, this control is a convenient method of proportioning when it is desired to adjust the proportion of alumina in the kiln feed, the alumina being a constituent remov-

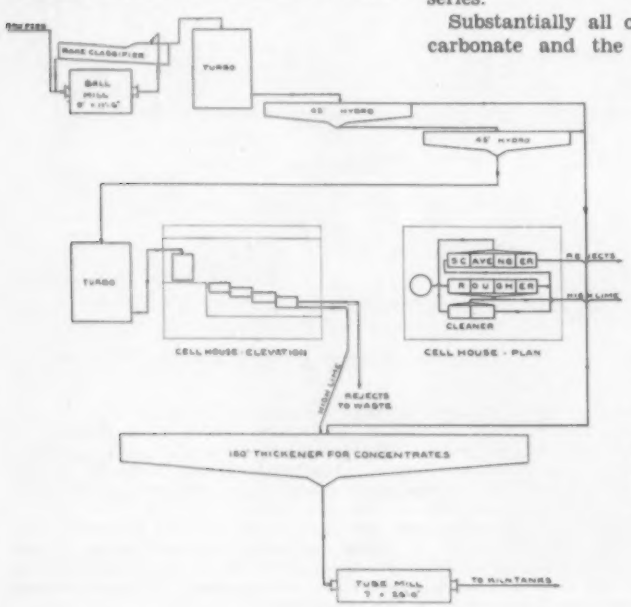
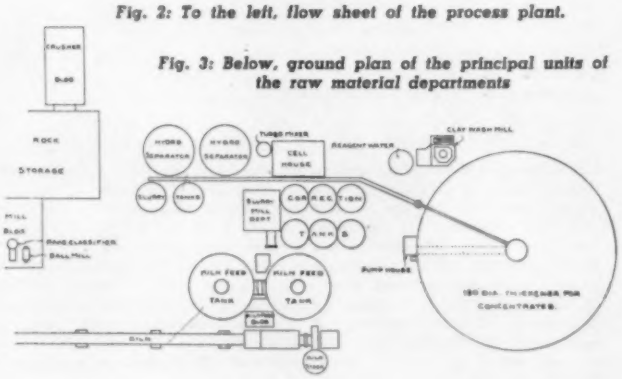


Fig. 2: To the left, flow sheet of the process plant.

Fig. 3: Below, ground plan of the principal units of the raw material departments



able by eliminating proportions of aluminum silicates during flotation.

Hydro-separation of the overflow of the bowl classifier has, accordingly, a number of advantages, both with relation to the chemical characteristics of the composition and the operating economy of the plant. The removal of the fine calcium carbonate and the necessary quantities of clay minerals, as hydro-separator overflow requiring no further treatment than combination with the high lime concentrates of the flotation cells, limits the quantity of material that must be treated by froth flotation to make the necessary chemical corrections.

Thus, the coarse fractions only, representing from 60 to 65 percent of the total quarried materials, must be treated by flotation, the excessive proportion of quartz being subtracted without wasting the disproportionate amount of grinding power that would be necessary to reduce it to normal kiln feed fineness, and its removal prior to final grinding has obvious advantages in mill economy. As the coarse product, forming the underflow of the second hydro-separator comprises largely calcite and quartz, the limited tonnage requires less equipment for flotation and simplifies that operation, as well as limiting the consumption of flotation reagents.

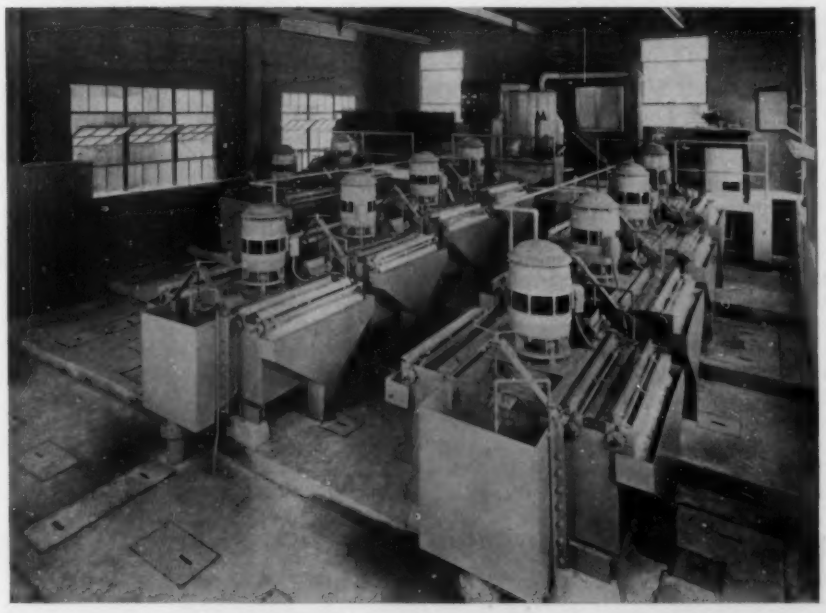
Increased fineness resulting from the elimination of the quartz prior to final grinding is illustrated by the results of six months operation, during which the ball mill grind averages 88.95 percent minus 100 mesh. The thickener underflow shows an increase in fineness to 80.0 percent minus 200 mesh. This thickener underflow is easily reduced to kiln feed fineness of approximately 90 percent minus 325 mesh in a simple open circuit grind in the 7 x 26-ft. tube mill, with low power consumption.

Chemical Analysis

Reference to the chemical analysis of the hydro-separator feed and the analyses of the overflow and underflow, given below, will show how completely the clay and fine calcite is recovered, and it will be understood that all of the coarse quartz is discharged in the underflow of the second separator, from which it is ultimately removed as the principal flotation reject. It will also be seen that the SiO_2/R_2O_3 ratio of the feed is 4.36; the overflow from the first separator 2.70; the overflow from the second separator 2.82; and the underflow from the latter, and which constitutes the flotation cell feed is 5.85. As some of the calcium carbonate is ground to about the same fineness as the clay minerals, and is recovered in the hydro-separator overflow and sent to the thickener without further treatment, it will be understood that the flotation cell feed comprises only about 60 to 65 percent of the materials quarried and sent to the plant, but that a sufficient quantity of high lime concentrates can be derived from this limited proportion to make the final correction of composition.

It is necessary to control the dilution of the feed to each hydro-separator, and to give both of them a uniform flow of solids. This is done by using a feed tank with a constant head and by discharging through an orifice. Check tanks installed on each hydro-separator make it possible to determine tonnages and dilutions at all times. Separate water lines are provided on each separator to correct dilutions, if necessary. The average analyses of the feed and classifier products are as follows:

	Hydro Feed	Hydro No. 1 Overflow	Hydro No. 2 Overflow	Cell Feed
SiO_2	28.70	24.00	24.64	30.83
Re_2O_3	2.57	2.95	2.75	2.36
Al_2O_3	4.01	5.93	5.97	2.92
CaO	33.35	33.32	32.52	33.52
$CaCO_3$	59.50	59.48	58.08	59.85
MgO	1.25	1.78	2.03	0.90
Loss	29.69	31.46	31.24	28.72
Total	99.55	99.44	99.15	99.30
Ratio				
SiO_2/R_2O_3	4.36	2.70	2.82	5.85



Interior of cell house. The rougher cells are the center row, the scavenger cells are at the right and the cleaner cells at the left. Reagent feeders appear in the back of each cell motor. The large tank in the background is the constant head tank feeding the rougher cells. Note concentrates overflowing the cells

Principal equipment of the cell house consists of a turbo-mixer, used for a surge tank and storage, an agitated feed tank and ten 56-in. flotation cells.

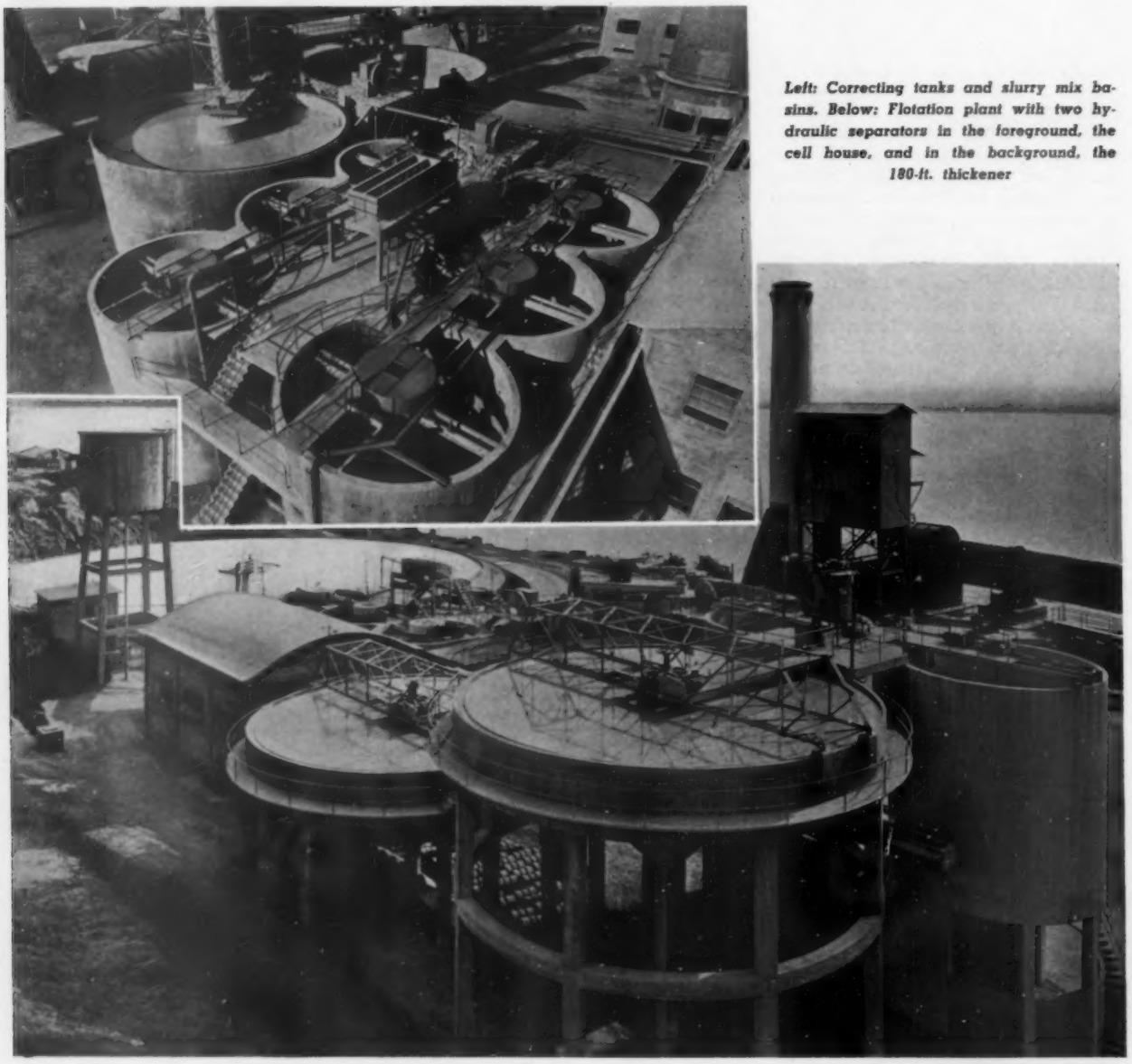
The actual flotation operation includes three distinct steps, namely "roughing," "scavenging" and "cleaning." The cell feed is delivered from the turbo-mixer to the agitated feed tank, which delivers material averaging about 59 percent $CaCO_3$, at an average dilution of about 28 percent

View looking toward crusher house showing storage, mill room, agitated storage tanks, constant head feed tank, two hydro-separators, cell house, and launder carrying hydro-overflow and flotation concentrates to thickener

solids, to the first of four "rougher" cells connected in series. The concentrates from these cells are high in lime and require no further treatment. The tailings from these cells include too much calcite to waste and they are, accordingly, submitted to a second operation, constituting the feed to four "scavenger" cells likewise connected in series. The scavenger concentrates are of relatively low grade and are, therefore, the feed to the first of two "cleaner cells", in series, the cleaned concentrates being combined with those of rougher flotation. The tailings of the second cleaner cells are added to the feed to the scavenger cells, i.e., the cleaner cells are in closed circuit with the scavenger battery. The tailings of the last scavenger cell are the final rejects of the plant and are pumped to waste. Good metallurgical results are obtained by proportioning the quantities of reagents fed to the scavenger and rougher cells, and by controlling accurately the dilutions of the feed to each group of cells, the latter being accomplished by the agitated feeding tank, which provides a constant head, and which is discharged through an orifice.

The grade of the flotation concentrates and the weight recoveries are under complete control and are kept uniform, so that simply by properly proportioning the tonnage fed to the flotation cells, with relation to the hydro-separator overflow, inversely as the $CaCO_3$ content of the quarried material changes, the mixture of the overflow with the concentrates in the thickener is maintained at the desired kiln feed composition. Operated in this manner, the process plant serves to produce a continuously corrected kiln feed, thoroughly mixed and blended by the natural action of the thickener, prior to final grinding. The principal flotation control is effected by feeding the proper quantity of calcite collecting reagent to each cell of the flotation circuit, each cell being equipped with an adjustable reagent feeder.

A novel, highly efficient reagent, developed jointly by Separation Process Co. and American Cyanamid Co., known as "Cyanamid 608", is used to concentrate the calcite. This reagent can be diluted in cold water and quickly dispersed in the flotation pulp under accurate control of quantities introduced at each stage, and requires no additions of frothing agent. Total re-



Left: Correcting tanks and slurry mix basins. Below: Flotation plant with two hydraulic separators in the foreground, the cell house, and in the background, the 180-ft. thickener

agent consumption for the flotation plant is about one-half pound of Cyanamid 608 per ton of cell feed, or $0.0065 (6½ mills) per barrel of clinker.

The overall efficiency, or lime recovery of the process, ranges from 97 to 98 percent, the quartz rejects being very low in lime. The following typical analyses illustrate the finished products of the flotation cells:

	Cell Feed	Rougher Concentrates	Cleaner Concentrates	Combined Concentrates	Rejects
SiO_2	30.88	3.44	3.00	3.37	75.68
Fe_2O_3	2.36	0.57	0.76	0.69	3.90
Al_2O_3	2.92	0.31	0.30	0.30	5.90
CaO	33.52	53.87	53.87	53.87	5.18
$CaCO_3$	59.85	96.20	96.20	96.20	9.24
MgO	0.90	0.32	0.55	0.34	1.05
Loss	28.72	41.22	40.96	41.05	9.40
Total	99.30	99.73	99.46	99.53	101.11
Ratio	5.85	3.91	2.78	3.74	7.71

The original method of operating the process plant was purposely planned to provide for a factor of safety in making the final correction of the mixture prior to burning. To this end, the thickener underflow was controlled to be 1 percent higher in lime than necessary. The underflow was then pumped to correction tanks, where sufficient clay slurry, from a clay wash mill, was added to correct the lime to the proper proportion, namely about 77 percent $CaCO_3$. After this correction, the mixture was ground to proper kiln feed fineness in one 7- x 26-ft. tube mill, and then sent to agitated storage tanks prior to burning. Operation of the plant, however, demonstrated that the controls provided for the flotation plant are of such accuracy that the underflow from the 180-ft. thickener can be held uniformly at satisfactory composition for burning. This reduces the necessity of adding wash mill clay and operating the wash mill, to final correction in exceptional cases.

Raw materials at Parana include about the normal quantity of alkalies that would be expected in raw compositions where alkali aluminum silicates comprise a substantial proportion of the clay minerals. The alkali in the material as quarried averages in percentage about 0.71, some of which is soluble, the insoluble portions being combined in the silicates. The feed to the cell house averages about 0.57 total alkalies, most of which is eliminated as the silicates are subtracted along with the coarse quartz and discarded. This also accounts for the reduction in total alumina. The combined flotation concentrates average only 0.13, and the total alkalies in the rejects average as high as 1.45. Although the proportion of the total alkalies occurring in combined form in the fine clay minerals remain in the kiln feed, most of the alkalies are driven off in burning, and clinker is almost entirely free.

Operating Capacity

Average tonnages of materials handled at each of the principal change points in the process, in long tons per day, are as follows:

	Tons
Ball Mill	998
No. 1 Hydro-Overflow	235
No. 2 Hydro-Overflow	119
Cell Feed	644
Flotation Concentrates	401
Rejects	243
Thickener Underflow	755

The cement produced, as described, is of high quality and strength, and remarkable uniformity, the average for the month of July, 1938, being:

ANALYSIS:		CALCULATED COMPOUNDS	
SiO_2	24.43	C_3S	38.2
Fe_2O_3	2.03	C_2S	41.3
Al_2O_3	4.91	C_3A	9.6
CaO	65.26	C_4AF	6.2
MgO	0.85	MgO	0.8
So_3	1.53	$CaSO_4$	2.6
Free CaO	0.33		
Ratio	3.53		98.7

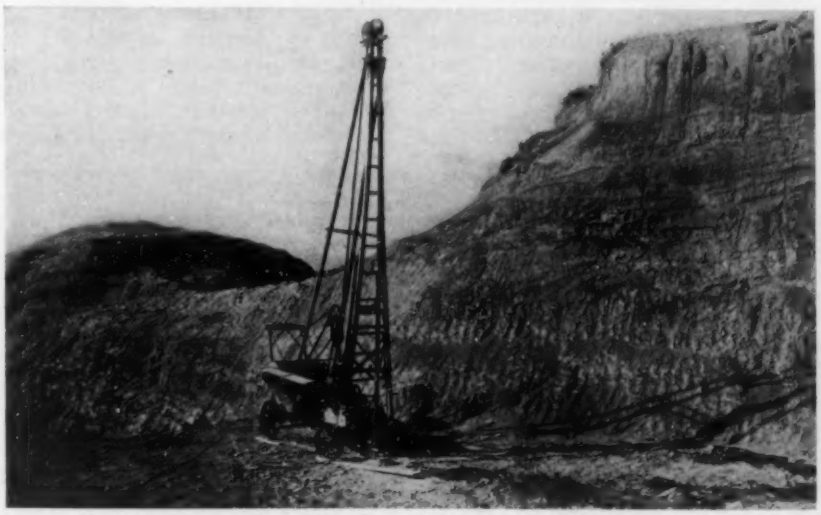
The clinker produced from the normal composition is easily ground to an average fineness of 96.1 minus 200 mesh and 87.0 minus 325 mesh, with a surface area of 1888. The initial set was 3:51, and the final set was 6:12.

Tensile Strength

24 hrs.	178 lbs.
2 days	266 lbs.
3 days	324 lbs.
7 days	402 lbs.
28 days	486 lbs.

Following the Lone Star general policy of the use of concrete wherever possible, all structures were designed and built of reinforced concrete. Argentine firms engaged in this work have developed reinforced concrete construction to a high degree, and the resulting structures are not only practical but embody architectural features that make the whole factory of impressive beauty.

All of the engineering of the plant was done by Lone Star Cement Corporation's own organization. Detailed designs of concrete structures, as well as of certain sections of the equipment, were made by contractors and equipment manufacturers with whom contracts for the construction and equipment were placed. General supervision and field engineering was also done by the local organizations of the Argentine subsidiary under the direct control of the Lone Star organization in New York.



Drilling blast hole. Note character of overburden and rock formation

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S. E. FINLEY of Atlanta, Ga., has been granted a patent on a method of combining natural mixtures of asphalt and aggregate to be used as a paving material with an artificial mixture of asphalt and aggregate. The combination, it is claimed, will provide nonskid, waterproof highways. It is said that Mr. Finley's combination of materials may be used in all regular thicknesses instead of being subject to "present thickness limitations."

PITTSBURGH HOUSING AUTHORITY, Pittsburgh, Penn., has reported that a contemplated plan to build 1256 family units in the first two "Hill" projects, based on average 4½-room dwelling units, will require $62,274 of concrete block and an additional $117,320 for concrete materials.

Safety in Mill and Quarry

Safety Congress In Chicago Analyzes Accidents

Safety in both mill and quarry was the dominant theme at the recent annual meeting of the Cement and Quarry Section of the National Safety Congress in Chicago. It was the first meeting of the new section created a few months ago by uniting the former Quarry Section membership with the Cement Section.

Members of the new organization not only attended in order to lay in a stock of brand new safety information, but they came also to start plans for a greater section—visualized to cover the entire rock products field and vitalized to reach every establishment throughout the country.

Section officers elected for the coming year are as follows: general chairman, F. B. Hunt, plant manager, Dewey Portland Cement Co., Davenport, Iowa; vice chairman, P. N. Bushnell, manager, personnel dept., Missouri Portland Cement Co., St. Louis, Mo.; second vice chairman, Th. Avnsoe, vice president, Lone Star Cement Corp., New York, N. Y.; secretary, A. J. R. Curtis, assistant to general manager, Portland Cement Association, Chicago, Ill.; assistant secretary, I. F. LeGore, safety engineer, Portland Cement Association; News Letter Editor, Jack Dempster, safety director, Canada Cement Co., Ltd., Montreal, Que.; chairman, engineering committee, Wm. Moeller, general superintendent, Lone Star Cement Corp., Dallas, Texas; chairman, Highway Safety Committee, M. A. Koffman, secretary Southwestern Portland Cement Co., Los Angeles, Calif.; chairman, Membership Committee, Col. H. A. Reninger, director, safety and welfare, Lehigh Portland Cement Co., Allentown, Penn. Chairman, Poster Committee, H. F. Yotter, General Crushed Stone Co., Easton, Penn.; chairman, Publicity Committee, M. P. Greer, Marquette Cement Manufacturing Co.; chairman, Statistics Committee, W. W. Adams, Bureau of Mines.

Executive Committee membership in addition to the officers, includes: R. B. Fortuin, Pennsylvania - Dixie Cement Corp.; W. M. Powell, Medusa Portland Cement Co.; E. Posselt, Lone Star Cement Corp.; J. B. Zook, Great Lakes Portland Cement Corp.; E. D. Barry, Universal Atlas Cement Co.; Wm. H. Baker, J. E. Baker Co.; V. P. Ahearn, National Sand and Gravel Association; Otho M. Graves, General Crushed Stone Co.; S. W. Stauffer, National Lime Association; A. L. Worthen, New Haven Trap Rock Co.; and J. R. Boyd, National Crushed Stone Association.

Report of the membership committee showed that the Section had a present membership of 144, of which 91 were transferred from other sections during the year.

At the First Session

The first session, Wednesday, October 12, was opened with a paper by I. F. LeGore of the Portland Cement Association, analyzing cement and quarry accident experience during the past year. Referring to the record revealed by the accident analysis of the Portland Cement Association, Mr. LeGore said in part:

"The splendid co-operation of plant managements and men forced the number of accidents per million man-hours worked in 1937 down one-third from the rate for 1936, and the severity of accidents as measured by time lost per thousand man-hours worked declined one-fifth.

"You will be pleased to know that the downward trend of disabling injuries established in 1937 has continued through the first eight months of 1938. There have been 37 percent fewer accidents than for the first eight months in 1937. The Bureau of Mines figures show a 17 percent decline in cement production and a 14 per cent drop in shipments, indicating that man-hours worked, or exposure to accidents, may drop about 15 percent under last year's total. With two-thirds of the year gone, it seems highly probable that the end of the 12 months will see the frequency of accidents per million man-hours reduced at least 25 percent from last year's rate of 5.17 to about 3.88. If this should be the case, the frequency rate of disabling injuries in the cement industry for 1938 would be, conservatively, 10 percent lower than it was in 1932, when it was at the all-time low level of 4.5. And this with plant activity 36 percent higher than its level during 1932.

Greater Reduction in Severity Than In Frequency Indicated for 1938

"In contrast to last year's safety picture, the severity of accidents reported so far this year is highly favorable. Up to this time in 1937 there had been no reduction in the number of accidental deaths over 1936. But in 1938, there have been only one-half as many fatalities as in 1937—six compared with twelve of a year ago.

"For the first time in 26 years, not one occupational death occurred in the entire cement industry in the first five months of the year. Four deaths occurred in June and two more in August.

Left: Fred Hunt, D. Harrington, and John J. Porter. Center: John J. Porter and Dr. Finch, head of the Bureau of Mines. Right: Dr. Finch, A. J. R. Curtis, C. L. Murray, W. W. Adams and H. F. Yotter

leaving six of the first eight months fatality-free. The best previous run of consecutive months without a single death ever reported was in the record year of 1932 when the industry operated the six months from July to the end of the year without any.

"The most arresting safety fact and biggest problem facing both the cement and quarry industries today is the severity of injuries. While the frequency of injuries to employes is less than the average for the 30 major industries reporting accident experience to the National Safety Council, the severity of injuries is much greater than the all-industries average. For instance, the cement industry's frequency rate for 1937 was 60 percent better than average, and the quarry industry's rate was 15 percent better than average. But in severity the two industries are far poorer than the average. Last year the cement industry's severity rate was 99 percent higher than the average and the quarry industry's rate was 77 percent higher than average.

"The experience of the past 15 years shows that fully 91 percent of the cement industry's severity rate has been produced by the economic time charges for fatalities, permanent total and permanent partial disabilities. In the past 10 years this percentage has been less than 90 only once, in 1932, when it was 88. In both 1934 and 1935, deaths and maiming injuries contributed 93 percent of the economic charges for all accidents. In 1936 the percentage advanced to 94, and in 1937 it was up to 95 percent, the highest in our history. For the quarry industry in 1937 this percentage was 88. Compare this weight of severity with that of the steel industry, which was 87, with that of the mining and construction industries of 84 percent, and with the foundry industry's economic charges for deaths and crippling injuries of only 78 percent.

What's the Answer?

"We have seen that from 90 to 95 percent of our problem of high injury severity lies in the incidence of fatal, permanent total and permanent partial disabilities, and that six-sevenths, or 86 percent, of accident costs go for these severe types of injury. What can we do about it?

"The suggestion, stop all accidents because any accident is a potential fatality or permanent partial disability, is only half an answer, for in 18 years we have reduced the number of accidents per million man-hours worked 90 percent and severity only 50 percent. The other half of the answer seems to lie in one word—safeguards.

"Intensive analysis of fatalities and permanent disabilities reported indicates that the engineering revision which contributed tremendously to safety progress in the early years of cement industry safety work may not be receiving proper emphasis today. Sixty-four percent of the 58 serious accidents reported in 1937, and 83 percent of the 29 serious accidents reported so far in 1938 are classifiable under four main heads:

(*a*) Moving machinery
(*b*) Electrical equipment
(*c*) High places
(*d*) Railroads

These are the four danger spots in cement plants. Each of them presents an environmental problem which management could reasonably be expected to solve largely by engineering."

Dr. Finch presents the Joseph A. Holmes Award to John J. Porter

Discussion

The spirited discussion which followed Mr. LeGore's paper was led by H. G. Jacobsen, for several years PCA safety engineer. Some of the high points of the discussion may be summarized as follows:

In reminiscing about safety prior to 1926, Mr. Jacobsen said that a record of only five or so cement employes injured per million man-hours last year would have seemed practically impossible when the annual frequency rate was more than five times that figure in 1925. High injury severity has been a major problem from the start, and the combination of the three E's—Engineering, Education and Enforcement, should be expected to solve that problem as it has so effectively solved the injury frequency problem. Mr. Jacobsen said he liked to think of the three E's in terms of three M's: Men, Machines and Materials.

P. N. Bushnell led a panel discussion under this head, in which the practical aspects of protecting against moving machinery, electrical, "high places" and railroad hazards received most of the attention. Bushnell put the question, "How do you find danger spots in your plants?" receiving a large number of responses of which the following are typical:

J. B. Zook, chief engineer, Great Lakes Portland Cement Corp.: "Our plant safety committee is very much alive and its meetings are given over as largely as necessary to consideration of, and action on, reported hazards."

M. P. Greer, safety engineer, Marquette Cement Manufacturing Co.: "Our departments always have their ears open for safety suggestions and turn these in promptly to the plant safety committee where they receive careful attention."

F. H. Sass, safety director, Universal Atlas Cement Co., Buffington plant: "A plant safety director must gain the confidence of all of the men, and keep constantly on the alert and among them, if he expects to keep a line on all the hazards that may be discovered."

In response to Mr. Bushnell's much argued question, "Can all gears be enclosed?" W. H. Weitknecht, superintendent of the Lehigh Portland Cement Co., Mitchell, Indiana, maintained that they could and should be. S. L. Greenawalt, safety director of the North American Cement Corp., stressed the extreme importance of seeing that guards are replaced, and replaced promptly, after temporary removal. He also stressed the importance of employing an inspection check list. William Moeller, general superintendent of the Lone Star Cement Co., Dallas, Texas, stated that a special inspection was made currently at their plant for mechanical hazards and that reports were made and acted upon promptly.

Mr. Bushnell stressed the apparent need for standard methods for the examination of gears, ropes, pulleys, chain, belts, and similar special hazards. C. A. Swiggett, superintendent of the Lehigh Portland Cement Co., Iola, Kan., advised starting out by guarding the most obvious hazards, continuing as long as danger spots can be found. He emphasized the prompt guarding of new machinery at the time it is put in.

Mr. Zook (Great Lakes) insisted that progress in safety depends on supervisors taking the time necessary to instruct their men carefully. E. W. Fitzgerald, safety director, Marquette Cement Manufacturing Co., LaSalle, Ill., placed it squarely up to the foremen to instruct their men adequately and then to keep on repeating. Mr. Curtis pointed out that training is a big need —to raise the standards of intelligence, cultivate thoroughness and quicken interest in mill inspection and for that matter, all other phases of safety activity. It is the trained man who can anticipate what might happen and meet emergencies promptly and decisively.

Luncheon Session

Speakers at the Section luncheon on Thursday were C. L. Murray, president of the Mason City Safety Council; Dr. John W. Finch, director of the U. S. Bureau of Mines, and John J. Porter, president of the North American Cement Corp. Mr. Murray described how the June no-accident campaign a few years ago in his home plant (Lehigh Cement at Mason City) had been broadened to include all of the local industries, then the people of the city, then surrounding Cerro Gordo County. Dr. Finch spoke of the splendid progress in safety made by the industries represented, then acting in his capacity as president of the Joseph A. Holmes Safety Association, presented the Joseph A. Holmes certificate of award to the Portland Cement Association for meritorious safety work.

Porter Accepts Award

John J. Porter, chairman of the Committee on Accident Prevention and Insurance, and a director of the Portland Cement Association, accepted the Holmes award on behalf of the Association. Mr. Porter paid tribute to the excellent co-operation of the U. S. Bureau of Mines, since the start under its first director, the illustrious Dr. Joseph A. Holmes, in the field of accident prevention and of its more recent but equally helpful statistical work.

Dr. Finch and his assistants, Daniel Harrington and John J. Forbes, have directed through their staff, the training of over 20,000 cement workers in first-aid work during the last few years and have co-operated with the cement and quarry industries continually in the prevention of accidents. The Bureau's statistical organization, directed by W. W. Adams, has also rendered a most useful service in promptly compiling and distributing current statistical information. Messrs. Harrington, Forbes, Adams, and C. A. Herbert of the Bureau staff, were present as guests.

Mr. Porter pledged the best efforts of the cement industry in its future safety work.

Thursday Afternoon

The Thursday afternoon session was opened with the subject: "What About the Health of Quarry Workers" which was discussed by W. C. James, safety engineer of the Portland Cement Association. Mr. James spoke in part as follows:

"The relation of quarry workers' health to their employment is dependent not only on the degree of exposure but also on the type of material being quarried. In 1913, Dr. Collis, English factory inspector, said that masons and quarrymen are said to regard sandstones as dangerous while limestones they regard as harmless. Any discussion of quarry health hazards must, therefore, be specific for the type of material being quarried, e.g., sandstone, granite, slate or limestone.

"Hayhurst, Kindel, Neiswander and Barrett, found, from the X-rays of 912 sandstone quarriers near Lorain, Ohio, that 28.3 percent had silicosis but only 1.4 percent showed a complication of tuberculosis. The death rate from tuberculosis did not appear to be much higher than in the average industrial group.

"In the silica sand industry, hydraulic mining and mechanical loading has minimized dust exposure. The effectiveness of engineering methods confirms the comment of Dr. Riddell at the Third Silicosis Conference: 'Engineers have met the problem (of silicosis) so energetically and with such intelligence that the occurrence of silicosis in many operations now considered hazardous will cease entirely during the next fifteen or twenty years.'

"Most of the information on granite workers deals with granite cutters rather than quarry workers. In 1934, Dreessen and Bloomfield examined 63 granite quarry workers who were exposed to rather high concentrations of dust and found that four-fifths of the men with 20 years or more service had silicosis.

"In the United States, Dreessen found only a trace of quartz in green slate and about 3 percent in red slate. Seventy-nine quarriers of this type of slate showed no lung pathology, but except in a few cases, they had been employed less than ten years.

"In northern Wales, a high death rate from tuberculosis in late life was seen among the slate quarriers in a study of vital statistics from 1922 to 1925. In this district, the slate contains 25 to 45 percent quartz. X-ray examinations, in 1930, of 120 men, showed that 46.6 percent of the men had non-specific fibrosis and fourteen men (11.6 percent) all of whom had more than twenty years' service, showed evidence of silicosis. The slate dust in the atmosphere of the sheds contained 40-50 percent quartz. The investigation concluded that the quartz in the slate dust is harmful, but takes longer to exert its effect than pure quartz would.

"Gardner's investigation of the cement industry has included the quarry workers. Although complete results of this survey have not been published, the evidence indicates that cement mill employes are a quite healthy group. The incidence of non-specific, harmless 'linear exaggeration,' of lung markings in the X-rays was only 13 percent, as compared with 46 percent in the Welsh slate industry. All but one percent was in the first stage. No correlation between length of service and incidence of this condition has been found, though a definite correlation between age and the condition is evident. This suggests that quarry employment is not the chief factor in the condition.

"Pneumatic hammer drillers showed a slightly higher incidence of the first stage condition, (15 percent) but no second stage change was noted. It must be emphasized that this condition is entirely distinct from silicosis, and is in no way indicative of a disturbance to health. No cases of silicosis attributable to limestone quarry employment were found, but every case was traceable to employment in hard-rock mines or sandstone quarries.

"No cases of active tuberculosis were seen in these quarriers. Among industrially employed males generally, about 2 percent will be found to have active infection. The scars of old or healed tuberculosis were seen in 3.8 percent of the films, as compared with from 4 to 11 percent in the general industrially employed male population.

"In this connection it is interesting to note that Dr. Gardner, in a paper read before the American Mining and Metallurgical Engineers, said: 'With calcium compounds, there is a tendency to deposition in the areas of tuberculosis degeneration and an accelerated healing of the infection . . . On the other hand, free silica, in the body at least, seems to have a specific, stimulating effect upon the growth of the tubercle bacilli.'"

The discussion of this paper was led by Mr. Warren A. Cook, superintendent of the engineering department, Zurich General Accident and Insurance Liability Company. Mr. Cook referred to a study of granite workers in Massachusetts which presented further evidence that quarriers are not subject to as great a hazard as stone dressers and finishers. He also emphasized the importance of engineering control methods in keeping dust concentrations of highly siliceous materials at a minimum.

The two concluding papers on the Thursday afternoon program, "Protective Devices, Clothing and Equipment for Rock Workers" by C. F. Lewis, superintendent of the Volunteer Portland Cement Company, and "Housekeeping for Quarry Safety" by H. F. Yotter, insurance supervisor of the General Crushed Stone Company, both of which contain much valuable information on safe quarry operation, will appear in a later issue of ROCK PRODUCTS.

Quarrying Asphaltic Stone

Crushing, Screening and Quarry Practices

By BROR NORDBERG

In Highland County, Ohio, 60 miles east of Cincinnati, is an interesting and somewhat unusual deposit of limestone which is impregnated with asphalt. It is now being quarried extensively and shipped by rail throughout Ohio and into other states. For a number of years the stone was used locally, but it is only within the last three years that rail facilities were made available for shipping longer distances.

This deposit of asphaltic limestone is probably the only one north of the Ohio river containing sufficient asphalt and occurring in large enough quantity to warrant commercial production. It is found within a limited area on the top of a hill six miles north of Hillsboro, Ohio, and is a leaner asphaltic limestone than those quarried in Kentucky and Northern Alabama.

Only three or four percent asphalt on the average is contained in the limestone, which is insufficient to bind under traffic when used as road surfacing. Additional asphalt must, therefore, be added, either at the plant or on the job, to meet paving material requirements.

Rebuild Stone Plant for Greater Capacity

In recent years, however, three companies were organized to quarry, grade and ship asphaltic limestone on a commercial scale. Two of these concerns are now operating. As the plants are in no way different than the ordinary small commercial stone crushing plant, it suffices to describe only the operations of one concern.

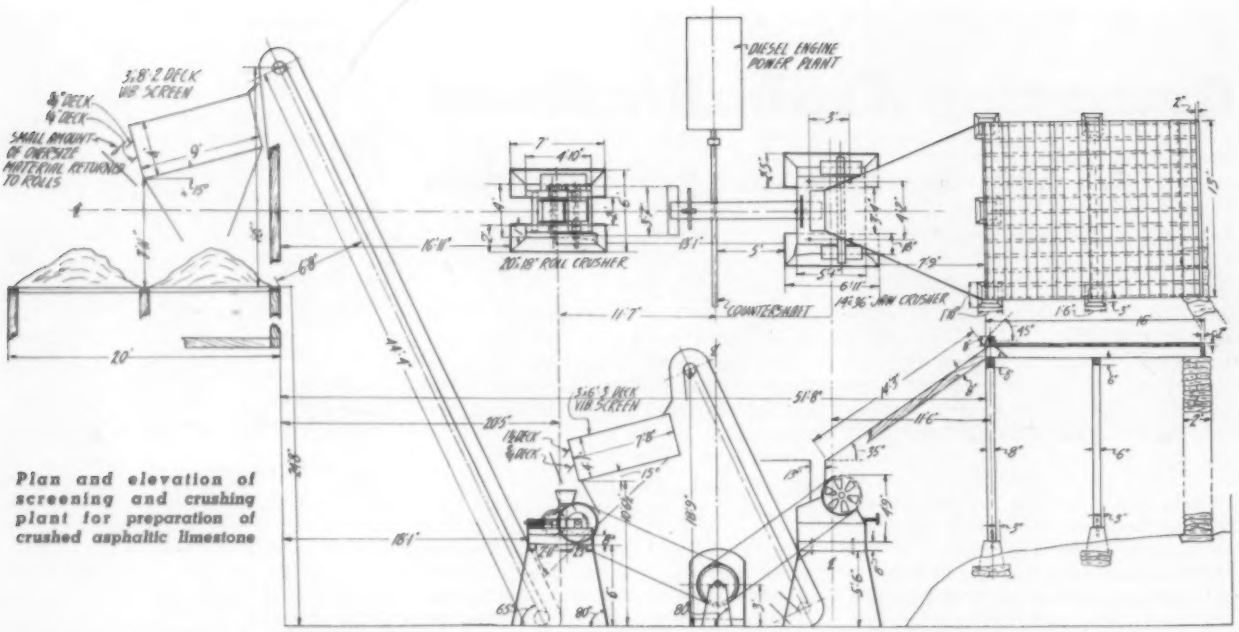
In 1935, the Ohio Asphaltic Limestone Co. was organized, and offices, laboratory and railroad facilities were built in New Vienna on the main line of the Baltimore and Ohio railroad. The quarry was opened and a crushing plant built from which stone is hauled 5½ miles to the rail siding. Early this year the plant was rebuilt to give greater capacity. In the particular area opened as a quarry, it is covered with three to four feet of top soil, which is stripped by steam shovel. The asphaltic stone below is from 13- to 15-ft. thick, but is covered with 4 ft. of material from which the asphalt has evaporated out over a period of years. This, too, is stripped off, crushed and sold locally. At the lower level of the deposit, the dark, asphaltic stone blends off rather sharply into a white, high grade limestone which goes down at least 60 ft.

The rebuilt plant, which was completed in May, 1938, does not differ very materially from the average, small commercial crushed stone unit and is simple in design. In fact, limestone from the lower level of the quarry occasionally is crushed and screened through the same plant, when asphaltic limestone is not being produced.

Quarry Practices

Holes for blasting both types of stone are put down by a Star well drill and secondary drilling is done with jackhammers powered by a Davey portable air compressor. The asphalt-bearing

View of the quarry. Note white strata, below asphaltic stone, which is high grade limestone, also quarried. Inset—Close-up of limestone impregnated with asphalt as it occurs in nature


DIESEL ENGINE POWER PLANT
3'8" 2 DECK VIB SCREEN
SMALL AMOUNT OF OVERSIZE MATERIAL RETURNED TO ROLLS
20"-18" ROLL CRUSHER
COUNTERSHAFT
14"-36" JAW CRUSHER
3'6" 2 DECK VIB SCREEN

Plan and elevation of screening and crushing plant for preparation of crushed asphaltic limestone

stone is very tough and requires more dynamite than the average white limestone quarried.

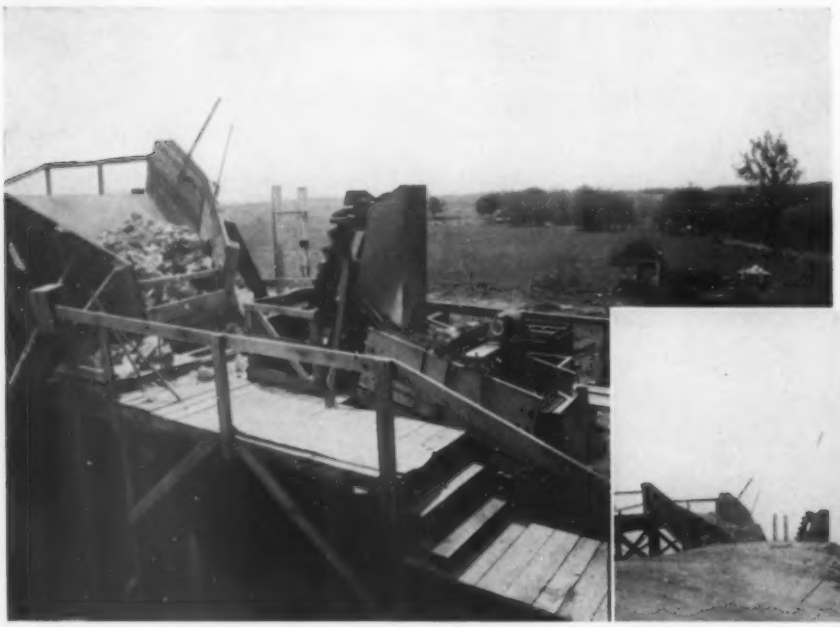
Screening Equipment Designed to Cut Down Rehandling Oversize

An Erie ¾-cu. yd. steam shovel loads the broken stone into either a Mack pneumatic-tired, 5-ton truck or a White 7-ton truck, which has solid tires. The trucks run up a ramp and discharge into a hopper which feeds a Cedar Rapids 14- x 36-in. primary jaw crusher. The crusher is set to produce minus 2-in. stone.

Coming from the crusher, the stone is elevated to a Deister "Plato" triple-deck, vibrating, scalping screen by a chain bucket elevator on 25-ft. centers. This screen is being operated with two decks only, the stone retained on both decks (all plus ¾ in.) being passed through a double roll type reduction crusher. This crusher, a Greenville of 20-in. diameter, has corrugated wearing faces. It will be noted in the accompanying illustration that very little material reaches the finish screen over the plant bins which is not ready for sizing, and only a small percentage of oversize must be re-handled.

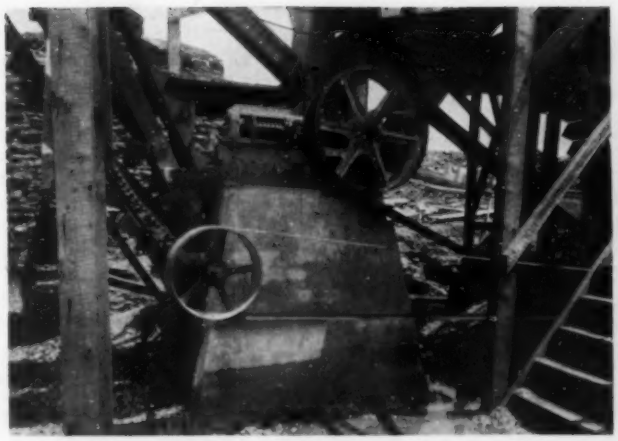
Throughs from the crushing rolls, together with minus ¾-in. stone bypassing them, are carried up a bucket elevator, 60-ft. centers, to a New Holland 3- x 8-ft. mechanical vibrating screen, where two sizes of stone are graded and placed into bins. The screen has ¾-in. and ¼-in. sq. openings on the top and bottom decks, respectively. Plus ¾-in. stone is returned to the crushing rolls and put back over the screen by the same 60-ft. elevator. Storage capacity is 250 tons in four bins, and the plant capacity is 350 to 400 tons of graded asphaltic stone, or limestone, in 10 hr.

Local orders are trucked from the bins, and for rail shipments the stone is trucked to New Vienna, where the company has a 16-car railroad siding.



Left: Scalping screen between jaw crusher and roll crusher. Throughs bypass the roll crusher

Below: Screening and storage plant where asphaltic limestone is graded. On the left is the hopper feeding primary crusher



Left: Roll crusher with corrugated roll surfaces for reduction of oversize. Right: Primary jaw crusher which reduces all stone to minus 2 in.

About 2½ percent asphalt is found in the ¼-in. to ¾-in. product, but the ¼-in. minus material averages about 3 percent. However, there are differences in the asphalt content in the quarry, although the character of this material and the stone is constant.

Operations are directed to produce a uniform asphalt content. At the laboratory, tests are made to determine the exact bitumen content of every car.

Preparing Products for Paving Materials

Much of the plant output is used as a retread surfacing material, but it is necessary to add bitumen to the natural stone in either one of two ways. Usually one inch of the ¾-in. stone is spread evenly on the roadway and about ½ gal. of cut-back asphalt per sq. yd. is applied with a road distributor. The materials are mixed with a grader blade, spread and then rolled. Asphaltic limestone screenings spread over the surface at the rate of 12 to 15 lb. per sq. yd. serve both as the seal and blot coat material.

Another method of correcting the natural rock material is to proportion by weight the exact amounts of lean asphaltic limestone with either emulsified or cutback asphalt and mix them in a mixer.

Rock to be crushed into a seal or blot coat material, or brick cushion, can be so selected that additional asphalt is not needed. For such applications, a low percentage of asphalt in the stone is desirable.

Little difficulty is encountered with "gumming" up of the crushers and of blinding in the screens as the asphalt content in the stone is relatively low. Even in extremely hot weather, no trouble is experienced in the jaw crusher. The corrugations on the roll faces will fill up with asphalt and a little blinding occurs on the fine screen cloth in very hot weather, but this is insufficient to cause any shutdowns. In the evening a wire brush is used to remove particles blinding the screen cloth, and the crushers and elevators are cleaned.

Power for the plant is furnished by a 90-hp. Fairbanks-Morse marine type Diesel engine. This drives all the major equipment through a series of flat belts and line shafts and is connected by Dayton cog-belt to a generator which develops electricity, at 110 volts, for the 5-hp. and 3-hp. motors driving the finish screen and scalping screen. When in full operation, the plant imposes a load of about 75 hp. on the Diesel engine.

John Cashman is president of the company; Neil Cashman, vice-president; and W. C. Mason, secretary-treasurer.

WHITEROCK QUARRIES, Pleasant Gap, Penn., has opened four new quarries for the purpose of getting out man-size limestone for use in open-hearth furnaces. The shipping point is at Howard, Penn. The company has a contract and is furnishing 35,000 tons of stone sand, which is being used in PWA construction at State College, Penn.

THE GOVERNMENT-OPERATED QUARRY at Snake Butte, Mont., has been very busy supplying rip rap stone for the Fort Peck dam. Rip rapping of the upstream face of the dam has been completed to elevation 2204, which is more than 175 ft. above the old Missouri river bed. A layer of blanket gravel 18 in. thick is spread over the face of the dam before rip rap is placed. The blanket gravel used varies in size from ½-in. to 12-in. Approximately 415,000 cu. yd. of stone have been placed to date.

FIELD BROTHERS, La Coste, Texas, have graded the road leading from Natalia to the hill west of Chicon Lake, where they are preparing to take out and grind caliche for use on the road from Natalia through Lutle, Texas. About 30 to 40 trucks will be engaged to haul the material from the pits to the construction site.

Sizing screen which drops sized stone into bins and returns oversize to the roll crusher

Figures Tell the Story of Plant Performance

By VICTOR J. AZBE

Consulting Engineer, St. Louis, Mo.

To carry on the Forum month after month and year after year is not exactly a simple problem. Not that there is not enough to write about, the field really is limitless, but so much of it requires extensive preparation which demands a great deal of time. At present six different articles are in preparation, some of which may not appear for a couple of years as essential information necessary to round out the article is missing, and often basic information is nowhere available. The articles in preparation are:

"Temperature control of lime kilns."

"The lime kiln cooler, its functions and effects."

"Relation of temperature and time of burning to lime availability and other physical properties of lime."

"Kiln efficiency based on heat available in various fuels for the process of dissociation."

"Resurrection of the short rotary kiln."

"The preheating zone, its design and effect on kiln performance."

"Time studies of gas and stone flow through lime kilns.

In between there will be reports on interesting old installations or notable new kilns. New natural-gas fired kilns will soon be built in Alabama, Missouri and Ontario. Two new wood fired plants are planned for Argentine. New producer-gas fired kilns are being built, and generally speaking there is considerable activity everywhere which will help to carry on these pages.

To those who are particularly interested in the Forum, it is suggested that they remove the pages and file or bind in a folder. The Forum editor, when leaving for an inspection or testing trip, never fails to take all of the issues of the last four years along. The volume is very convenient for reference, as some of the many varied items that have appeared may apply exactly to the problem.

In this issue, the article consists of a series of tabulations that should prove valuable to any student of gas producers. An attempt is made step by step to show what is going on; how the heat is distributed in the various com-

LIME FORUM

Mr. Azbe is a contributing and consulting Editor of ROCK PRODUCTS. He will be glad to receive inquiries from his readers, and will answer these direct or through the columns of this Forum.

MATHEMATICAL AND THERMAL ANALYSIS OF GAS PRODUCER OPERATION WITH CO_2 AS ENDOTHERMIC AGENT

(1) ANALYSIS AND HEAT VALUE OF COAL AS FIRED

	%
Moisture	8.5
Ash	8.4
Fixed Carbon	51.0
Volatile Matter	32.1
Sulphur	1.0
Heat Value	11766 B.t.u.

(2) DISTRIBUTION OF HEAT IN COAL

	B.t.u.	%
Heat in Fixed Carbon	7300	62.1
Heat in Soot and Tar	680	5.7
Heat in Volatile Matter	3786	32.2
	11766	100.0

(3) COMPOSITION OF VOLATILE MATTER FROM COAL

	Percent
Carbon Dioxide CO_2	3
Carbon Monoxide CO	7
Ethylene C_2H_4	6
Methane CH_4	36
Hydrogen H	47
	100
Heat Value per Cu. Ft.	573 B.t.u.
Total Heat in Volatile Matter	3786 B.t.u.
Volume of Volatile Matter (cold)	6.8 Cu. Ft.

(4) ANALYSIS OF PRODUCER BLAST

	%
Carbon Dioxide	3.4
Oxygen	17.5
Nitrogen	79.1
	100.0

(5) CARBON DIOXIDE CONTENT IN KILN GAS—30%

(6) BLAST DILUTION AND AMOUNT OF KILN GAS USED IN PRODUCER

Percentage of Kiln Gas used in Producer 11.34%

Blast Dilution with waste gas 1 plus 0.195 ..... 1.195

	Cu. Ft.	Lb.
Air Used	37.1	2.73
Waste gas used	7.2	.620
Total Blast	44.3	3.458

(7) COMPOSITION, VOLUME, WEIGHT AND CALORIFIC HEAT CAPACITY OF PRODUCER GAS

	Total Volume Cu. Ft.	Percent Volume	Weight Per Cu. Ft.	Actual Weight	Percent Weight	B.t.u. Per Cu. Ft.	Total B.t.u.
CO_2	2.64	4.4	.11598	.308	6.59	.....	....
CO	15.46	26.1	.07381	1.140	24.8	322.6	4990
H	3.17	5.3	.00531	.0168	3.65	324.5	1028
C_2H_4	.396	.6	.07389	.0292	6.35	1641.0	650
CH_4	2.375	4.2	.04226	.102	2.21	1012.6	2405
N	35.13	59.4	.07385	2.592	56.40	.....	....
	59.171	100.0	.0708	4.1860	100.00	153.5	9073

Higher Heat Value ..... 9073 B.t.u.
Lower Heat Value ..... 8573 B.t.u.
Higher Heat Value per Cu. Ft. 153.5
Lower Heat Value per Cu. Ft. 145.0

(8) RESULT OF COMBUSTION OF FIXED CARBON IN HOT ZONE OF PRODUCER

Total Fixed Carbon 0.51 lb.
15 Cu. Ft. of CO
.5 lb. of Carbon to CO 28.2 Cu. Ft. of N
0.29 Cu. Ft. of CO_2
.01 of Carbon to CO_2 1.13 Cu. Ft. of N

	B.t.u.
Heat Generated C to CO	2250
Heat Generated C to CO_2	146
Total Heat generated in Producer	2396
Percent of total heat in coal	20.3

(9) SENSIBLE HEAT CONTENT OF PRODUCER GAS

Temperature of Gas Leaving Producer 1320° F.

Gas	Weight	B.t.u. per pound	B.t.u. Content
CO_2	.306	327	99.9
CO	1.140	329	375.0
H	.0168	4675	78.0
C_2H_4	.292	329	94.0
CH_4	.102	1360	138.0
N	2.592	329	853.0
H_2O	.085	726	61.0
			Total 1698.0

(10) PRODUCER HEAT BALANCE

	B.t.u.	%
Calorific Heat in Gas	9073	77.12
Sensible heat in gas	1698	14.44
Heat in Tar and Soot	680	5.79
Evaporation of Water	85	.74
Unaccounted	224	1.91
	11760	100.00

(11) SECONDARY AIR REQUIRED FOR COMBUSTION OF GAS

Gas	Weight lb.	Air required per lb.	Actual Air
CO	1.140	2.46	2.8
H	.0168	34.56	.54
C_2H_4	.0292	14.81	.43
CH_4	.102	17.28	1.76
			Total 5.53 lbs.

(13) COMPOSITION OF PRODUCTS OF COMBUSTION

	Weight-lb.	Volume	Percent of Vol. Dry
CO_2	2.57	22.2	19.55
O	....	....	.....
N	6.76	92.5	80.45
H_2O	.47	Condensed	Condensed
Total	9.80		

(12) WEIGHT DISTRIBUTION OF PRODUCTS OF COMBUSTION

	Pounds
Weight from Coal	.916
Weight of Air Blown Into Producer	2.73
Weight of Kiln Gas Blown Into Producer	.62
Weight of Secondary Air used to burn the gas	5.53
Total weight of products of combustion per lb. of coal as fired	9.80

(14) HEAT CAPACITY OF PRODUCTS OF COMBUSTION AT JUNCTION POINT OF PREHEATING AND DECOMPOSITION ZONES AT TEMPERATURE OF 1425° F.

CO_2	400. x 2.57	1028 B.t.u.
N	380. x 6.76	2570
H_2O	860. x .47	404
Total B.t.u. not available for lime burning		4002

(15) HEAT AVAILABLE OR NON-AVAILABLE FOR MAKING OF LIME

Heat in gas, tar and soot, sensible and calorific, when leaving producer	11536 B.t.u.
Sensible heat in gases leaving dissociation zone of kiln in part available for stone preheating	4002 B.t.u.
Latent heat of water vapor unavailable for lime making	526 B.t.u.
Maximum possible ratio of CaO to fuel under ideal conditions	7-1
Portion of original heat in coal available for lime making	82%

(16) LOSS DUE TO KILN GAS USED IN PRODUCER BLAST

The loss is equivalent to heat carried by the .62 lb. of gas used from the decomposition zone into the preheating zone; further assuming that this gas finds its way into the producer at a temperature of 200° F.

Heat lost	232 B.t.u.
Percent of heat available for lime making	3.62%

ponents of coal; what is the composition of volatile matter, what portion is gasified in the combustion and in the distillation zone of the producer; what heat can be used in the kiln and what is unavoidably lost. However, such assembly of information requires much time to compile. One should not expect, therefore, to get much from these Forum pages unless he devotes a corresponding amount of time to their study. They are not light reading in any sense.

Notes:

(A) Carbon in ash was ignored as it is a controllable loss, which may be high or negligible. Sulphur also was not considered; it may be present in a form generating heat and again it may not.

(B) Calculations were based on a good grade Illinois coal. With higher grade eastern coals, most figures will be greater in proportion to the higher heat value.

(C) Losses due to radiation,excess air, incomplete combustion, carbon in ash, and terminal temperature heads are controllable losses and are not considered. These losses prevent the attainment of a 7 to 1 ratio with this coal and a ratio of 8.5 with high grade eastern coals. However, good plants will utilize to an advantage from 70 to 80 percent of available heat, and the ratio for Illinois coal would be about 5.25 to 1 and 6.5 to 1 for eastern coals when stone is high calcium and considerably more when dolomitic is used.

MATERIAL SERVICE CORP., Chicago, Ill., has purchased the Riverside Lime & Stone Co., Chicago, with plant at Lyons, Ill. The deal became effective on October 1.

Burn Marble Spalls

EDGAR BAKER OF BATESVILLE, Ark., has installed a new rotary lime kiln at the St. Clair Marble Co. quarry five miles south of Guion, Ark. The kiln, which is said to be the first rotary kiln to be installed in North Arkansas, is 6- x 90-ft., and will have a capacity of 100 ton of quicklime per day. It will be fired with crude oil. Material to feed the kiln will be taken from an immense pile of waste stone on the dump below the marble company's quarry. When this is consumed quarry operations will be started. A large proportion of the tonnage from the new lime plant will be sold to paper mills in the south.

Operating Under Trusteeship

CHEMICAL LIME CO., Bellefonte, Penn., operator of the world's longest rotary lime kiln and two shaft kiln plants, has been operating since January under section 77-B of the Federal Bankruptcy Act, after first being placed in receivership December 2, 1937. C. P. Wynne, Scranton, Penn., and R. S. Townsend, Stroudsburg, Penn., were appointed trustees by the court.

Construction of the new plant was begun in December, 1935, when the Chemical Lime Co. was reorganized, and the plant was financed largely through an RFC loan of $720,000. Receivership proceedings were started with the coming of the present business recession, when sales of lime were insufficient to pay operating expenses and finance charges.

Pending acceptance by the court of an equitable reorganization plan, the plants are in production and in recent months shipments of rotary kiln lime have sometimes equalled the plant capacity. In September, sales of the latter averaged about 140 tons daily and at times equalled the kiln capacity of 200 tons per day. Trustees have invited bids for taking over the company and several appraisals have been made, but as yet no federal bid has been filed.

B. Magee of Bellefonte is general superintendent in charge of all operations. He was one of the designers of the rotary kiln plant at the time of the last company reorganization and had since that time been in active charge of the plant. Prior to his affiliation with the Chemical Lime Co., Mr. Magee had been connected for six years with the American Lime and Stone Co., also of Bellefonte.

The kiln is now producing 200 tons of high calcium lime in 24 hr. and is doing so with a fuel ratio very close to 4:1. In the month of September the fuel ratio averaged 3.87:1, using a 14,000 B.t.u. coal. In this month there were two shutdowns which necessarily reduced the average operating efficiency. At continuous and full capacity the efficiency ratio is slightly higher than 4:1. The kiln is being operated with a stack analysis of 10 percent O_2 and about 0.5 percent CO.

Request Injunction Over Cement Rate

AN INJUNCTION suit has been filed against the Southern Pacific Co. by the Riverside Cement Co. and the Southwestern Portland Cement Co., charging that the railroad planned to establish a special and discriminatory rate for transportation of portland cement from Monolith, Calif., to Wahoo, site of the Hansen Dam. The complaint set forth that the railroad company notified the U. S. district engineer that it intended to establish a reduced rate from Monolith to Wahoo, and it was alleged that such reduction would make Monolith Portland Cement Co. low bidder on 75,000 bbl. of cement required for the dam. A low bid of $1.42 per bbl. for bulk cement delivered on the job was made jointly by the plaintiffs, the suit stated, while the only other bids opened were from the Monolith Co. whose plant is at Monolith, and from the California Portland Cement Co. with mills at Colton.

THE BURMA LIME & CHEMICAL CO., LTD., of which Bhatter, Chunder & Co., Calcutta, India, is the managing agent, has been formed with a capital of 1,000,000 rupees. A modern plant for the manufacture of hydrated lime and, eventually, dry ice, precipitated chalk, sodium bicarbonate, caustic soda, bleaching powder, mineral acids and halogen compounds is to be erected in Calcutta. It is said that much of the machinery has been purchased from French companies.

SOUTHERN STATES LIME CORP., Knoxville, Tenn., has signed a new wage agreement with the Federal Labor Union, an A. F. of L. affiliate, covering wages and working conditions.

Estimation of Phase Composition of Cement Clinker

Part 3

A method has been presented for the computation of phase composition when the phases which may be present are known. In the examples given to illustrate the method, the phases which may be present have been supplied, and all that remained to be done was to perform the operation involved in the computation. In dealing with problems of this type, the method which has been given may always be applied, but it is necessary to determine in advance the phases which may be present.

To illustrate the procedure, let us suppose that the phase composition of mixture X, Fig. 7, at equilibrium at 1700 deg. C. is to be estimated. The first step is to determine what phases may be present. It is known at the outset that the liquid must be on the 1700 deg. C. isotherm. The problem is to determine at what point on this isotherm the liquid is located. Experience in interpreting phase diagrams will enable one to locate the point quite rapidly, but the problem will be considered here as it might be dealt with by one lacking extensive experience in the interpretation of phase diagrams. The procedure will be to start at the point S, at one end of the isotherm, and to follow it until the required point is found.

Liquids on the isotherm between S and T may exist in equilibrium with solid CaO at 1700 deg. C. According to principle 5, any mixture composed of solid CaO and a liquid must be on the line joining the CaO vertex and the liquid. The point X does not lie on any line which might be drawn from CaO to a point between S and T. It is therefore known that the liquid present in mixture X when equilibrium is attained at 1700 deg. C. can not be on the S-T portion of the isotherm.

The liquid at T may exist in equilibrium with solid CaO and C_3S. Again applying principle 5, any mixture composed of CaO, C_3S and liquid T must be in the triangle CaO-C_3S-T. This triangle is not shown in the figure, but it can be seen by inspection, or by the aid of a straight-edge, that X does not lie in this triangle. Thus the point T is eliminated.

The point X does not lie on any straight line which might be drawn between C_3S and a point between T and Y. At the point Y, the liquid is on the boundary between the C_3S and C_2S primary phase regions, and, if Y is the liquid present, the point X must lie in the triangle C_3S-C_2S-Y. Although the triangle is not shown in the figure, it can be seen by inspection that the point X does lie in this triangle. It is known, therefore, that Y is the liquid sought, and that the mixture X, at equilibrium at 1700 deg. C. is composed of solid C_3S and C_2S and a liquid of the composition Y.

The phases present at equilibrium being known, the phase composition of mixture X at 1700 deg. C. may be estimated. The compositions of mixture X and liquid Y, in terms of C_3S, C_2S and C_3A, may be estimated by the method illustrated in Fig. 2, and the calculations may then proceed as in the early part of the paper. Or, if desired, the proportions of C_3S, C_2S and Y may be estimated graphically by treating the triangle C_3S-C_2S-Y as a triangular diagram. For this purpose the points C_3S, C_2S, Y and X have been transferred from Fig. 7 to Fig. 8, and the triangle C_3S-C_2S-Y drawn. The lines AX and BX, drawn from X to the side C_3S-Y, and parallel to the other two sides, divide that side into segments C_3S-A, A-B and B-Y, which are proportional to the percentages of Y, C_2S and C_3S respectively in mixture X.

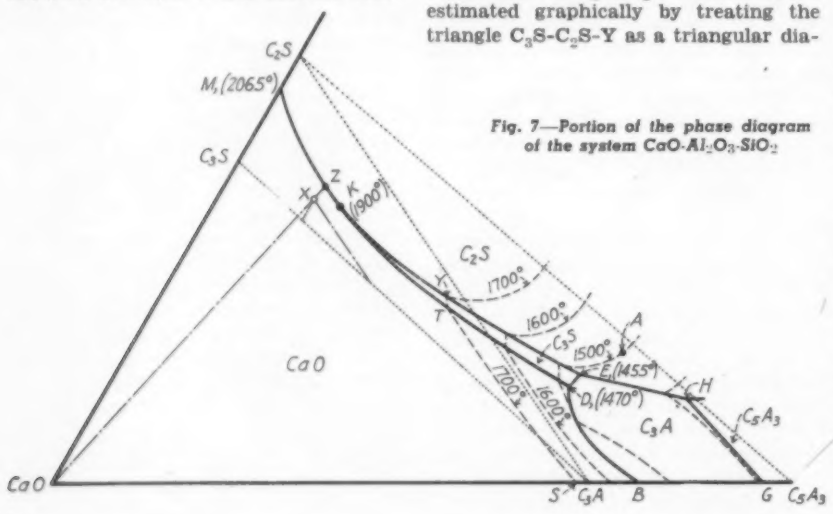


Fig. 7—Portion of the phase diagram of the system CaO-Al_2O_3-SiO_2

The liquid Y, which was involved in the foregoing problem, is in the triangle C_3S-C_2S-C_3A. Its composition can therefore be expressed in terms of positive percentages of C_3S, C_2S and C_3A. This is not true, however, of all liquids encountered in estimating phase composition of portland cement mixtures. The liquid E, (Fig. 7) for example, which may be present in any ternary portland cement mixture at 1455 deg. C., the temperature of liquid formation, is outside of the triangle. It can not possibly be formed from C_3S, C_2S and C_3A. The procedure, however, is to calculate percentages of C_3S, C_2S and C_3A by applying equations 1 to 4, obtaining a composition in which the per cent of C_3S is negative. The fact that the latter is negative indicates that E is outside of the C_3S-C_2S-C_3A triangle in a direction away from the C_3S point. Although it follows that E can not be formed from C_3S, C_2S and C_3A, the composition so obtained may be used in the calculation as though the C_3S were actually present in a negative proportion. The phase composition of mixture X at 1455 deg. C., with liquid E present, will be calculated to illustrate the procedure.

Before proceeding with the calculations, let us consider the phases which may be present in mixture X when equilibrium is attained at 1455 deg. C. Liquid E is capable of existing in equilibrium with three solid phases C_3S, C_2S and C_3A. These points, and the point representing liquid E, have been transferred to Fig. 9. From principle 5, any composition within the figure C_3S-C_2S-E-C_3A may be composed of these four phases at 1455 deg. C. Since mixture X is in this figure, it may be com-

In the System $3CaO.SiO_2$-$2CaO.SiO_2$-$3CaO.Al_2O_3$-$4CaO.Al_2O_3.Fe_2O_3$ at Clinkering Temperatures

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posed of the four phases when in a state of equilibrium. But since any two or three of these phases may also exist together in a state of equilibrium at that temperature, other possibilities should be considered. Since X is within the triangle C_3S-C_2S-E, it may be composed of C_3S, C_2S and liquid E. It may be observed also that at 1455 deg. C. the three solid phases C_3S, C_2S and C_3A

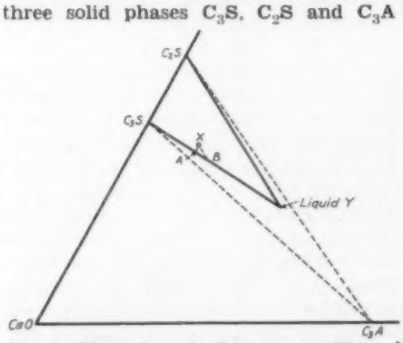


Fig. 8—Estimation of phase composition of mixture X at 1700 deg. C.

are capable of existing in equilibrium with liquid E, and are consequently capable of existing in equilibrium with one another, in the absence of liquid, at that temperature. Thus, mixture X, which is in the triangle C_3S-C_2S-C_3A, may be composed of those three compounds, with no liquid, at equilibrium at 1455 deg. C. Two states of equilibrium with three phases present are possible at 1455 deg. C., as follows:

1. Solid C_3S, solid C_2S and liquid E.
2. Solid C_3S, solid C_2S, and solid C_3A.

If the only condition imposed is that the mixture is at equilibrium at 1455 deg. C., the problem of estimating phase composition is indeterminate. Either of the above series of phases may be present, or there may be any number of intermediate states in which all four phases are present.

The situation which has been described arises from the fact that crystallization, or fusion, proceeds without change of temperature at an invariant point. The difference between the two states is in heat content. In attaining the second state from the first by withdrawing heat, there is no reduction in temperature, because of the release of latent heat of crystallization. The first state occurs with maximum heat content at 1455 deg. C., the second with minimum heat content. The first state may also be defined as a state of equilibrium, with maximum liquid, at 1455 deg. C.

The phase composition of mixture X at 1455 deg. C. may be calculated for the second state, in which crystallization is complete, by applying equations 1 to 4. For the first state, with maximum liquid, the compositions of mixture X and liquid E may be expressed in terms of C_3S, C_2S and C_3A, and the phase composition calculated by the method given in the early part of the paper. The required potential composition of X, may be estimated by the method in Fig. 2, and the potential composition of E calculated from its oxide composition in Table 1 by applying equations 1 to 4. These potential compositions are given below.

	Mixture X	Liquid E
C_3S	63.1	-50.5
C_2S	18.4	63.1
C_3A	18.5	87.4

In setting up equations for the solid phases, with m representing the fractional proportion of liquid, the signs of

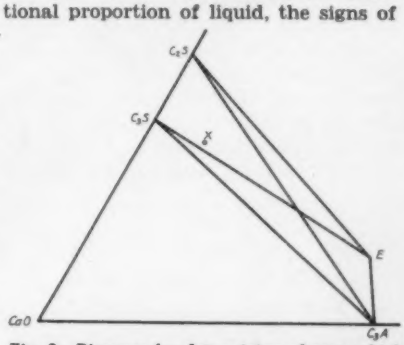


Fig. 9—Diagram for determining phases which may be present in mixture X at 1338 deg. C.

the m-terms are opposite to those in the potential composition of E, as shown below.

$$\text{Solid } C_3S = 63.1 + 50.5\ m$$
$$\text{Solid } C_2S = 18.4 - 63.1\ m$$
$$\text{Solid } C_3A = 18.5 - 87.4\ m$$

The third equation gives the lowest value of m, which is 0.211. C_3A is therefore the disappearing phase, and 21.1 percent liquid is present when maximum fusion at 1455 deg. C. occurs. Substituting 0.211 for m in the equation, the phase composition is found to be 73.8% C_3S, 5.1% C_2S, 21.1% liquid E.

The Quaternary System CaO-Al_2O_3-SiO_2-Fe_2O_3

A quaternary system cannot be represented in a triangular diagram, but requires the use of a space model. This is in the form of a tetrahedron, which is a solid geometrical figure with four trianglar faces. Each vertex represents one of the four components. Any individual composition is represented by a point in the space model, in much the same manner as in a triangular diagram. Fig. 5 illustrates one method of locating a composition in the space model (see ROCK PRODUCTS, October, 1938, p. 47).

As in the ternary system just discussed, the compositions involved in portland cement problems are located in a portion of the system near the CaO vertex. The components at the vertices of the space model of the system, as investigated by Lea and Parker (2), are not the oxides CaO, Al_2O_3, SiO_2 and Fe_2O_3, but the compounds CaO, C_2S, C_5A_3, and C_4AF. The space model of the system is shown in Fig. 10.

The triangles forming the faces of the space model represent ternary systems. In the investigation of a quaternary system these ternary systems are investigated first, since the boundaries between primary phase regions in any one of these faces are intersections of the particular face with surfaces which are to be located in the interior of the tetrahedron. Some of these ternary systems were investigated by other workers before the investigation of the quaternary system by Lea and Parker was undertaken. The system CaO-C_2S-C_5A_3, which is the base of the space model, is the ternary system shown in Fig. 7, investigated by Rankin and Wright (4). The system CaO-C_5A_3-C_4AF, forming one of the faces, is a part of the system CaO-Al_2O_3-Fe_2O_3, investigated by Hansen, Brownmiller and Bogue.[5]

In Fig. 7 and 10, the region K-D-E is the C_2S primary phase region. In the space above K-D-E in the space model, between the surfaces K-D-T_1-X-L and K-E-T_2-W-L, C_3S is the primary phase. The volume between these surfaces is termed the primary phase volume. The space model is divided by surfaces in this manner into primary phase volumes for C_3S, C_2S, C_3A, C_4AF and C_5A_3. The location of the primary

phase volumes may be defined by stating the surfaces which bound them. Liquids on each of these surfaces are capable of existing at equilibrium with two solid phases at some definite temperature which may be indicated by isotherms on the surface. The primary phases for each surface are given in the following list of surfaces bounding the phase volumes.

CaO primary phase volume

KLM	CaO-C_2S
KLXT$_1$D	CaO-C_2S
T$_1$PBD	CaO-C_3A
T$_1$PJX	CaO-C_4AF

C_2S primary phase volume

KLXT$_1$D	CaO-C_2S
KLWT$_2$E	C_2S-C_3S
DET$_1$T$_1$	C_2S-C_3A
XWT$_2$T$_1$	C_2S-C_4AF

C_3A primary phase volume

DET$_1$T$_1$	C_2S-C_3A
T$_1$T$_2$ROP	C_3A-C_4AF
T$_1$PBD	CaO-C_3A
RHGO	C_3A-C_3A_3

C_3S primary phase volume

KLM	CaO-C_3S
KLWT$_2$E	C_2S-C_3S
T$_2$RHE	C_3A-C_3S
T$_2$RVW	C_3S-C_4AF
RHI	C_3S-C_3A_3

C_4AF primary phase volume

XWT$_2$T$_1$	C_2S-C_4AF
T$_1$T$_2$ROP	C_3A-C_4AF
T$_1$PJX	CaO-C_4AF
T$_2$RVW	C_3S-C_4AF

C_3A_3 primary phase volume

RHI	C_3S-C_3A_3
RHGO	C_3A-C_3A_3

The intersection of two boundary surfaces is a quintuple line. Three primary phase volumes meet at every point on a quintuple line. Any liquid on a quintuple line is capable of existing in equilibrium with three solid phases. Quintuple lines in the system are listed below, with the solid phases designated.

QUINTUPLE LINES IN SYSTEM CaO-C_2S-C_3A-C_5A_3.

	Solid phases
T$_2$E	C_3S-C_2S-C_3A
T$_2$T$_1$	C_3S-C_3A-C_4AF
T$_2$W	C_3S-C_2S-C_4AF
T$_2$R	C_2S-C_3A-C_4AF
RH	C_2S-C_3A-C_5A_3
KL	CaO-C_3S-C_2S
DT$_1$	CaO-C_3S-C_3A
XT$_1$	CaO-C_3S-C_4AF
PT$_1$	CaO-C_3A-C_4AF

The junctions of primary phase volumes in the space model are invariant points at which, at some particular temperature, the liquid is capable of existing in equilibrium with the solid phases designated for those volumes. The compositions of the invariant points involved in this study, and the solid phases with which they can exist in equilibrium at specified temperatures, are given in Tables 1 and 2. (Table 1 on page 48, ROCK PRODUCTS, October, 1938.)

TABLE 2—INVARIANT POINTS IN THE SYSTEM CaO-Al_2O_3-SiO_2-Fe_2O_3 (2)

Point	Temp. (°C.)	Solid Phases	Composition CaO	Al_2O_3	SiO_2	Fe_2O_3
T_1	1341	CaO, C_2S, C_3A, C_4AF	55.0	22.7	5.8	16.5
T_2	1338	C_2S, C_3S, C_3A, C_4AF	54.8	22.7	6.0	16.5
W	1348	C_2S, C_3S, C_4AF	52.4	16.3	5.8	22.5
X	1347	CaO, C_3S, C_4AF	52.8	16.2	5.6	25.4
R	1280	C_2S, C_3A, C_3A_3, C_4AF	50.0	34.5	5.6	10.0
P(5)	1345	CaO, C_3A, C_4AF	47.0	43.0		10.0

Portland cement compositions in the system are located in a portion of the tetrahedron C_3S-C_2S-C_3A-C_4AF in the space model. Since these are the phases with which liquid T_2 may exist in equilibrium at 1338 deg. C., it is known that this liquid is the first stable liquid formed when such mixtures are heated, and that the temperature of liquid formation is 1338 deg. C. Partial fusion at 1338 deg. C. will consequently be considered first.

Let us designate the percentages of C_3S, C_2S, etc., in the potential composition of any given cement clinker as $(C_3S)_p$, $(C_2S)_p$, etc., and the percentages of solid phases in the phase composition as $(C_3S)_s$, $(C_2S)_s$, etc. The potential composition of liquid T_2, calculated by applying equations 1 to 5 to its oxide composition is 1.4% C_3S, 16.2% C_2S, 32.2% C_3A, 50.2% C_4AF. The percentages of the solid phases are given by the equations:

$(C_3S)_s = (C_3S)_p - 1.4\ m$ .....(14)

$(C_2S)_s = (C_2S)_p - 16.2\ m$ .....(15)

$(C_3A)_s = (C_3A)_p - 32.2\ m$ .....(16)

$(C_4AF)_s = (C_4AF)_p - 50.2\ m$ .....(17),

in which m is the fractional proportion of liquid.

The value of m, when maximum fusion occurs at 1338 deg. C. is the lowest of the quantities, $(C_3S)_p/1.4$, $(C_3S)_p/16.2$, $(C_3A)_p/32.2$ and $(C_4AF)_p/50.2$. The quantity which determines the value of m also determines the phase which disappears. Compositions in the tetrahedron C_3S-C_2S-C_3A-C_4AF may therefore be divided into four classes, with reference to the phase which disappears, and which determines the proportion of liquid.

The small potential C_3S in liquid T_2 indicates that it is near the triangle C_2S-C_3A-C_4AF in the space model. A very small change in the composition assigned to T_2 would give the potential C_3S a negative value, indicating that it is located on the other side of the triangle. In that case there would be only three classes of composition with reference to the phase which disappears at 1338 deg. C. Lea and Parker have expressed a doubt as to whether the accuracy of their estimation of the composition of T_2 is sufficient to warrant a positive conclusion as to its direction from the C_2S-C_3A-C_4AF plane. In view of this uncertainty, and the small chance of encountering cement compositions in which C_3S would be the disappearing phase, only three classes of composition will be considered here.

For any given mixture, the phase composition with maximum fusion at 1338 deg. C. may be calculated by introducing numerical values for $(C_3S)_p$, $(C_2S)_p$, etc., in equations 14 to 17, and proceeding as in the calculations in the early part of the paper. In addition to its part in the calculation of phase composition at 1338 deg. C., the evaluation of m will designate the class to which the composition belongs, and will determine the course of change in composition which will occur as the temperature is raised above 1338 deg. C. This will be shown with reference to each class.

[5] Hansen, W. C., Brownmiller, L. T. and Bogue, R. H. Studies on the System CaO-Al_2O_3-Fe_2O_3. Journ. Am. Chem. Soc., 50, 396 (1928). Paper No. 13, Portland Cement Association Fellowship, U. S. Bureau of Standards.

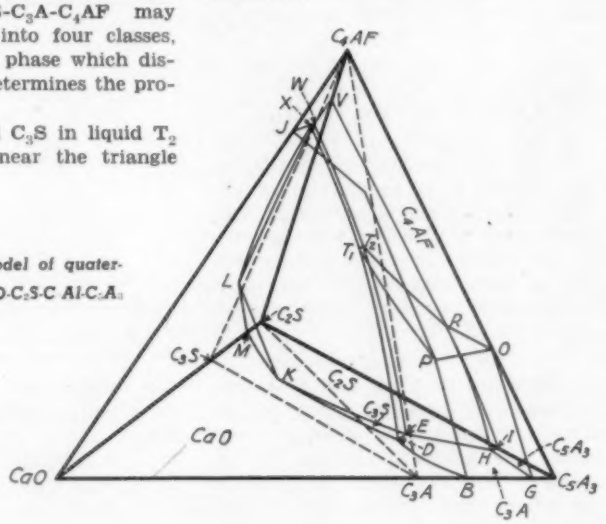


Fig. 10—Space model of quaternary system CaO-C_2S-C_3A-C_4AF

Remove Shale from Gravel

Portable Sand and Gravel Plant Solves Competitive Problem

To combat the inroads of portable plants, which are quite prevalent in Iowa, and to obtain a considerable volume of business rightfully belonging to the permanent stationary plant operator, the Northwestern Gravel Co., Lake View, Iowa, purchased a new all-steel portable plant.

Production with the new portable unit was started early in 1937, four miles north of Lake View, and at about the same time the company's stationary plant at Lake View was dismantled and rebuilt at a new location eleven miles southeast of the town. Relocation of this unit became necessary because the deposit at Lake View was "running out" of material. It is somewhat similar to the permanent plant it displaced, except for capacity and the installation of equipment for the removal of shale.

The new deposit runs about 60 percent gravel, which is ideal for the production of concrete aggregates for construction and maintenance of highways. However, certain sections of the deposit contain relatively high percentages of shale which must be reduced to a maximum of 0.8 percent by weight to meet the Iowa State Highway specifications for this material.

Stripping and excavating are done by a Northwest gasoline-driven 1¼-cu. yd. dragline. The excavated material is placed in a 5-cu. yd. steel field hopper, and is trucked to the plant by International and Chevrolet 6-ton trucks with an average load of 4-cu. yd. each. Here the trucks dump to a hopper, having a capacity of 20 cu. yd., which feeds the belt conveyor to the screening plant. A Link-Belt apron feeder regulates the flow of material to the 24-in. belt conveyor, 170-ft. centers.

The discharge does not pass through the typical rotary scrubber, but to a box similar to the wash boxes receiving the pipe discharge in dredge-operated plants. The box is rectangular, about 4-ft. in depth, and is partitioned into two compartments.

This is where the "scrubbing" action takes place. A new 8-in. Dayton-Dowd centrifugal pump was installed to provide water for washing and "scrubbing," water being taken from a sump which fills from a river nearby. The pump is driven by a 60-hp. Continental direct-connected gasoline engine which has a 10-in. suction and a 10-in. discharge. With a head of about 50 ft., the water discharges downward into the wash box or "scrubber," half of the water going to each side of the partition, scrubbing and churning the sand and gravel with considerable pressure.

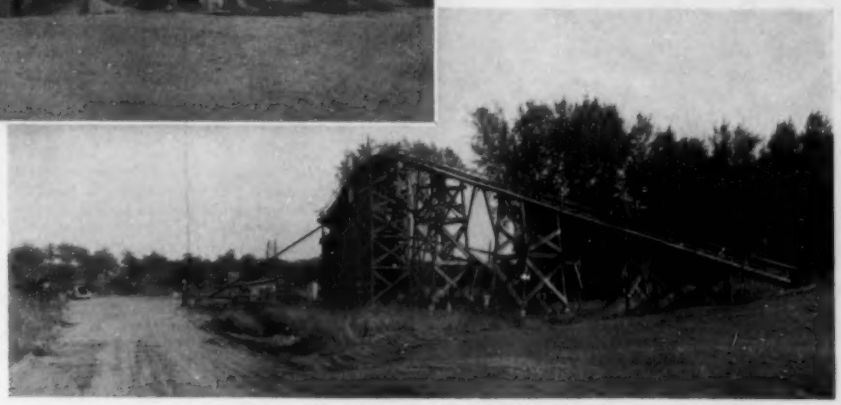
Sand, gravel and water from each side of the box passes through a series of eight (four on each side) Link-Belt 86¾-in. conical screens in tandem, the coarse sizes going to bins below. The two top screens are scalping screens with 1½-in. round openings. No wash water is applied at this point. Oversize gravel is chuted to a 9- x 36-in. Iowa jaw crusher on the ground below, the crusher throughs returning to the main conveyor over a 24-in. belt conveyor, on 50-ft. centers.

Method of Removing Shale

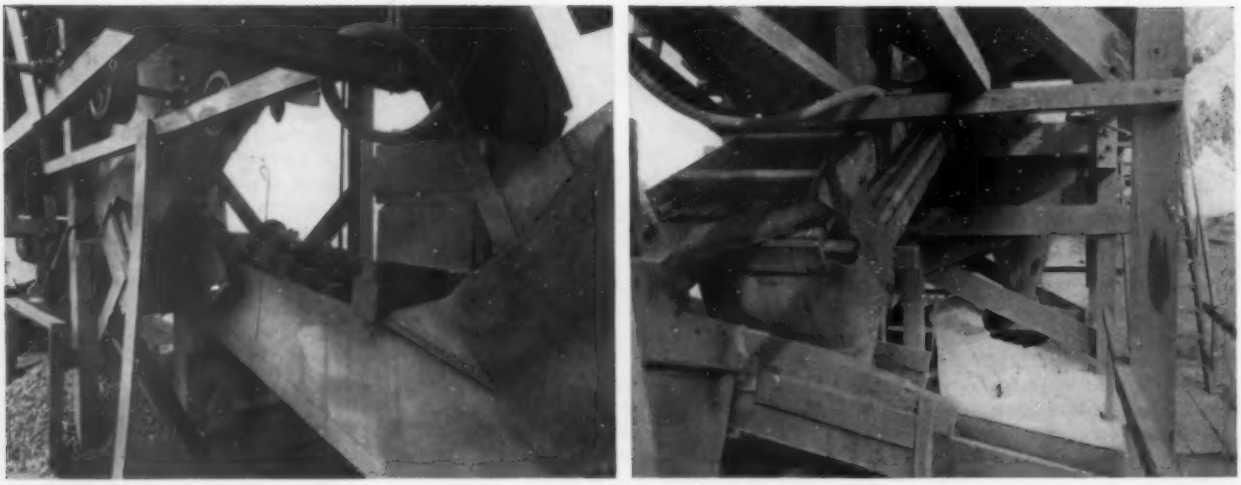
Shale content in the material is of such character that by removing only that contained in the ¼- to ¾-in. gravel, the percentage contained in the concrete aggregate will not exceed specification requirements. Those particles in the larger gravel are somewhat difficult to remove without sacrificing some of the smaller gravel.

The minus ¼-in. product from the lower revolving screens may go directly

Left: Portable plant of 100-ton per hour capacity. Washing unit is in the foreground and the crusher is in the background



Right: New permanent sand and gravel plant replaces unit which was in a deposit that had "run out"



Left: Vibrating screen to remove excess fines. Sand is recovered in two 5-ft. settling tanks in background. Oversize gravel goes from the screen to the shale remover. Right: Gravel washer and shale remover to take out shale particles from ¼- to ¾-in. gravel

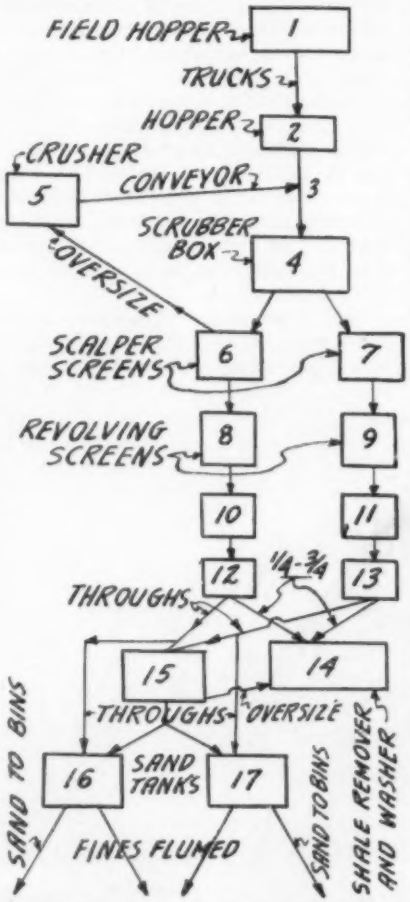
to the settling tanks or over a 3- x 8-ft. Universal single-deck vibrating screen with variable screen mesh (usually ¼-in. sq.) to check the minus ¼-in. material or take out an additional size, in which event the throughs go to the settling tanks. The two 5-ft. Link-Belt settling tanks are of the adjustable weight type, automatically emptying when a given quantity of sand has settled. The overflow and waste fines are flumed to the river.

The ¼- to ¾-in. gravel and sometimes the rejects on the vibrator screen are chuted to an 18-in. Eagle Iron Works twin screw washer and shale remover. The rising water to float off shale is taken from a 3-in. pipe connecting into the main water line, and the volume of water is regulated by a hand valve. The discharge from the washer and shale remover goes directly to bins. All shipments are made by truck, and gasoline engines drive all equipment since electrical power is unavailable at this location. A 65-hp. Continental gasoline engine drives all equipment, except the crusher which is driven by a 60-hp. Climax engine. Capacity of the plant per hour is 90 tons of gravel and 75 tons of sand.

Portable Plant Equipment and Layout

The new portable plant, which is manufactured by the Diamond Iron Works, Minneapolis, Minn., has a capacity of 100 tons of washed sand and gravel per hour. Material is trucked to a hopper and fed to a 30-in. belt conveyor on 55-ft. centers by a 24-in. by 3-ft. feeder.

Conveyor discharge material is scalped over a 4- x 10-ft. screen, the oversize going to an Austin-Western No. 104 gyratory crusher. A 20-in. belt conveyor, 55-ft. centers, returns the crushed gravel to the main conveyor. The scalper throughs are taken to a 40-in. by 13-ft. revolving scrubber screen with a 4-ft. scrubber and an 8-ft. sand jacket over a 24-in. belt conveyor, 70-ft. centers.



Flow sheet of operations at permanent plant. 1—5 cu. yd. field hopper. 2—hopper feeding belt. 3—belt conveyor, 170-ft. centers. 4—scrubber box, water is applied under pressure. 5—Iowa 9- x 36-in. jaw crusher. 6, 7—Link-Belt 86 ¾-in. scalping revolving screens. 8 to 13—Link-Belt 86 ¾-in. revolving sizing screens. Wash water applied in all six. 14—Eagle Iron Works 18-in. twin screw washer and shale remover. 15—Universal 3- x 8-ft. vibrating, single-deck screen. 16, 17—Link-Belt 5-ft. sand tanks of the weight-discharge type

Fines go through a 36-in. by 12-ft. drag washer to bins and the gravel is sized over a 3- x 8-ft. triple-deck vibrating screen. The washed sand and gravel are stored in four 20-cu. yd. bins. Wash water is provided by a 6-in. Morris pump driven by an 80-hp. International Diesel engine. A 60-hp. Allis-Chalmers gas engine drives the crusher, scalping screen and the two belt conveyors, 55-ft. centers; and a 50-hp. International gas engine drives the scrubber screen, the vibrating screen, the sand drag, and the belt conveyor, 70-ft. centers.

To PROVIDE a detailed description of the impinger method of determining air dustiness used by the Bureau of Mines a bulletin has been prepared known as Information Circular 7026, "A Technique for Use of the Impinger Method", by Carlton E. Brown and H. H. Schrenck. Copies may be obtained by addressing the Bureau of Mines, Washington, D. C.

VERMONT ASBESTOS MINES, division of the Ruberoid Co., Eden, Vt., is the new name of the former Vermont Asbestos Corporation, a wholly-owned subsidiary of the Ruberoid Co. Since 1936, when the Ruberoid Co. first became interested in the Vermont property, extensive improvements made in the plant buildings and equipment have increased the production of asbestos fiber by more than 35 percent. About 200 men are employed.

Study Industrial Minerals

A growing division of the American Institute of Mining and Metallurgical Engineers is Industrial Minerals. This year the division held its annual meeting at Knoxville, Tenn., October 6-8, in conjunction with the Society of Economic Geologists. J. R. Thoenen, U. S. Bureau of Mines, was chairman of the Institute meetings and Donald H. McLaughlin, Harvard university, was chairman of the Economic Geologists.

The main theme of the meeting was the character and possibilities of southern industrial minerals. Papers included: "Modern Mining and Beneficiation of Barite at Cartersville, Ga.", by David P. Hale, Jr.; "Barite Deposits in Tennessee", by R. A. Laurence; "The Oolitic Limestone Deposits of Franklin County, Alabama", by W. B. Jones; "The Sienna Deposits of the Cartersville District, Georgia," by T. L. Kesler; "Tennessee Slate," by H. C. Amick; "Rock Asphalt Deposits of Colbert County, Alabama," by Nicholas A. Rose; "Alabama Marble," by W. H. Runge; "Mica Pegmatites of North Carolina," by Alice Allen and L. K. Sharpe; "Lithium Pegmatites of the Carolinas," by F. L. Hess; "Comparison of Feldspar Deposits of Spruce Pine with Europe," by C. S. Maurice; "Feldspar Mining in North Carolina," by H. O. De Beck.

With Stanton Walker, director of engineering and research, National Sand and Gravel Association, as chairman,

(Continued on page 56)

(1) Left to right: J. R. Thoenen, chairman, Industrial Minerals Division, American Institute of Mining and Metallurgical Engineers; Dr. M. M. Leighton, chief geologist, Illinois; Alden H. Emery, secretary-treasurer, Industrial Minerals Division. (2) Dr. Leighton and Dr. Frank H. Reed, Illinois Geological Survey, at entrance of T.V.A. laboratory; extreme right, G. R. Mansfield, U. S. Bureau of Mines. (3) Group at Norris Dam. (4) Industrial minerals engineers and (5) chemists visit ceramics laboratory of T.V.A. at Norris, Tenn.

NATIONAL ASSOCIATION ACTIVITIES

Crushed Stone

NATIONAL CRUSHED STONE ASSOCIATION has mailed to associate members a circular describing the arrangements for the machinery exhibit to be held in connection with the annual convention of the industry, Netherland Plaza hotel, Cincinnati, Ohio, January 30-February 1, inclusive, 1939. L. W. Shugg, General Electric Co., Schenectady, N. Y., is director of exhibits, as he has been for the past few years.

Industrial Sand

The semi-annual meeting of the board of directors of the National Industrial Sand Association was held in Washington, D. C., October 4, with the following present: Russell G. Hay (president), L. M. Hansen (vice-president), Ralph T. Stevens (treasurer), E. J. Beyer, P. S. McDougall, A. J. Miller, J. M. Strouss, W. J. Woods. Also present were E. M. Ayers, Wilbert Bivens, J. S. Cable, T. C. Matthews, Nathan C. Rockwood, Charles G. Runkle, Harry F. Spir, Theodore C. Waters, Floyd M. Wheat, V. P. Ahearn (executive secretary), and Stanton Walker (consulting engineer).

T. C. Waters, counsel for the association in workmen's compensation matters, submitted a report concerning recent association activities in New York State having to do with compensation insurance rates. After full consideration by the board, it was agreed to accept the report and the executive secretary was instructed to make a copy of it available to all member companies. Upon the recommendation of Mr. Waters and Mr. Ahearn the board agreed that the executive secretary be authorized to renew the present contract of the association with the Sayer Industrial Relations Corporation.

The various federal laws, rules and regulations affecting the industry were discussed at some length by Executive Secretary Ahearn, and a very instructive round-table discussion resulted as to the possible application of the new wage and hour law. Mr. Ahearn emphasized that there is no daily limitation on working hours; a man may work four days of 11 hours or three days of 14 hours, for example, but he must not work over 44 hours a week without time-and-a-half for overtime. It was suggested that in the case of monthly salaries, subject to the law, that they be reported on a 40-hr. basis at such an hourly rate that with time and overtime they add up to the monthly figure. This will save revising them at the times when the 42- and 40-hour weeks become the law.

Stanton Walker, consulting engineer to the association, reported on the activities of the committee on foundry sands which, under authorization made by the board, was appointed by the research committee. He pointed out that the committee had held a meeting in Pittsburgh, August 18, at which time there was thorough discussion of its future scope of activities. The committee agreed that the first principal activity should be a consideration of the significance and effect of recommendations of the American Foundrymen's Association for sand requirements—with particular attention directed to those affecting the production of sand.

Sand and Gravel

NATIONAL SAND AND GRAVEL ASSOCIATION has supplied associate members with a new list of the entire industry.

Executive Committee Meeting

A very representative group of the sand and gravel industry gathered in Washington, D. C., September 28 and 29, on the occasion of a special meeting of the executive committee of the National Sand and Gravel Association. The members of the executive committee attending were: J. Rutledge Hill, president, Dallas, Tex.; Paul P. Bird, vice-president, Boston, Mass.; H. S. Davison, secretary-treasurer, Pittsburgh, Penn.; M. A. Neville, Lafayette, Ind.; George W. Renwick, Chicago, Ill.; John M. Settle, Louisville, Ky.; Hal. V. Owens, past-president, Utica, N. Y.; Alex. Foster, Jr., past-president, Philadephia, Penn. Other members of the board of directors, or members of the association, and guests present were: Harry Stewart, Pittsburgh, Penn.; W. A. Bliss, Pittsburgh, Penn.; H. P. Caldwell, Louisville, Ky.; David Alexander, Petersburg, Va.; J. F. Berger, Trenton, N. J.; Anderson Dana, New York City; V. P. Ahearn and Stanton Walker, of the association. Guests were S. A. Phillips, Nathan C. Rockwood, Chicago, Ill., A. M. Parker, Washington, D. C.

Research Director Reports

Stanton Walker, director of engineering, reported on the research work of the association including: (1) coöperative study with the U. S. Bureau of Mines on the modulus of elasticity of stone and concrete, which he thought might eventually revolutionize methods of testing concrete; (2) a study of sands as to grading and durability; (3) adhesion of bitumen to aggregates; (4) continuing study of aggregates by locality, so that specifications for them can be written economically. He discussed at length the association's connection with the University of Maryland where the research laboratory is located (ROCK PRODUCTS, August, 1938, p. 79) and the possibility of interesting undergraduate students in thesis work which might prove helpful in aiding some phases of the needed research. Prof. S. S. Steinberg, dean of the college of engineering, was a guest during part of the meeting and expressed his pleasure and satisfaction with the coöperative arrangement between the association and his college. On the afternoon of the second day of the meeting the members of the executive committee visited the laboratory.

The rest of the meeting was largely given over to Executive Secretary Ahearn to explain the federal wage and hour law, the Walsh-Healey act, the report of the President's (F. D. R.) Commission on Labor Relations in Great Britain, the activities of the Temporary National Economic Committee, and other federal government moves affecting the industry. Mr. Ahearn expressed the hope that the wage and hour law would not be given a narrow interpretation because it might then become in effect a state tariff law, placing undue handicaps on interstate shippers. (That very interpretation has since been given the law; see comments by Mr. Ahearn elsewhere in this issue).

Ready Mixed Concrete

The technical committees of the National Ready Mixed Concrete Association met in Washington, D. C., Septem-

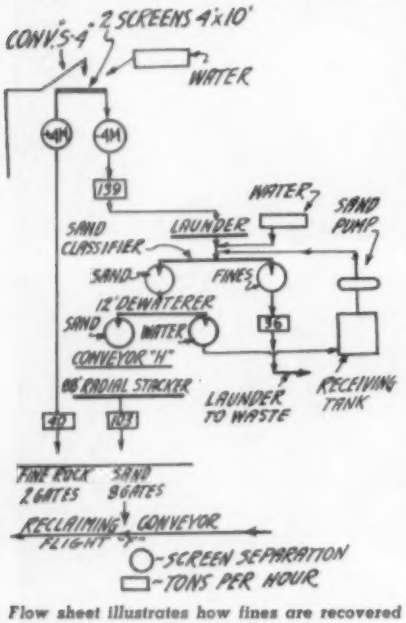
(Continued on page 56)

Just a few candids to portray the atmosphere! (1) From left to right: M. A. Neville, Lafayette, Ind.; Paul P. Bird, Boston, Mass.; George W. Renwick, Chicago, Ill.; (2) Stanton Walker, director of engineering, and "Ham" P. Caldwell, Louisville, Ky. (3) Chairman and President J. Rutledge Hill, Dallas, Tex. (4) Geo. W. Renwick in a thoughtful mood. (5) Executive Secretary V. P. Ahearn brings smiles (must have been "slap her down pappy"). (6) Hal. V. Owens, Utica, N. Y. (7) M. A. Neville, Lafayette, Ind. (8) Paul P. Bird, Boston, Mass.

HINTS AND HELPS for Superintendents

Increases Fine Sand Recovery

AFTER FULL OPERATION got under way at the Hiwassee Dam aggregates plant of the Tennessee Valley Authority, it was found that some desirable fine aggregate was being lost in the dewatering device. By reference to the description of the plant in ROCK PRODUCTS, September, 1938, it will be noted that the fine aggregate is made of crushed stone passing 4-mesh on two 4- x 10-ft. Symons vibrating screens.



Flow sheet illustrates how fines are recovered from overflow of de-waterer

This minus 4-mesh material is laundered to a Nordberg-Wood Auto-Vortex bowl classifier, where the excess fines are rejected and wasted—to give about 10 percent minus 100-mesh in the finished product. The discharge of the sand classifier is to a Dorrco washer or dewaterer, overflow being wasted.

In practice it was found that some of the desired fines were being removed in the dewaterer. The easiest and surest way to solve the problem, according F. Cadena, engineer of design and construction for the plant, was to catch the overflow from the dewaterer in a tank or basin, thus feed it to a Wilfley sand pump (which has no suction) and return the water and fines to the Nordberg-Wood classifier.

By keeping the classifier in closed circuit with the dewaterer and wasting only the overflow of the classifier, it is possible to retain in the dewatered sand the desired or necessary percentage of fines. This should furnish an idea to many sand plant operators, for there is little doubt that many are wasting fines, now being generally specified, when they could be recovered.

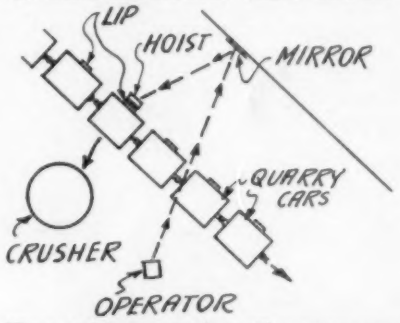
Double-Purpose Washer

BRILLIANT SAND CO., Brilliant, Ohio, has devised a unique re-washer at its new plant for re-washing stocked gravel just before shipping it. The re-washer consists of a 20-ton steel bin of such height that gravel can flow through a top chute into railroad cars and through one lower down into trucks. Gravel stocked in open pits is placed by clamshell directly into the re-washer bin which is always kept full. When the hinged gate is let down for car-loading, the flow is by gravity over a gravity screen. Water is applied over the bed of gravel as it flows across the chute screen under pressure from a 4-in. line connected to a 4-in. Deming pump.

The bottom of the bin has the rear side sloping at 45 deg. toward the front to give drainage when loading trucks. In loading trucks, a flexible 4-in. line from the same pump is placed with the open end extending into the top of the bin. Water is applied by a turn of the valve and flows through the gravel toward the bottom of the bin. Here the water escapes from the bin through 3/16-in. mesh wire cloth on the front side of the bin.

Dumping Quarry Cars

LOUISVILLE CEMENT CO., Speed, Ind., recently added a number of 9-cu. yd. one-way dump Easton body quarry cars for hauling stone and shale to the primary crusher. At the crusher, the cars are dumped by a pneumatic hoist which engages a projecting lip on the car. The hoist and lip are on the far side of the car from the operator, who also operates the car spotter. To assist him in spotting cars accurately so that the hoist will engage the lip, a large mirror was mounted on the crusher housing framework on the far side from the operator. By looking between cars and seeing the image in the mirror, he now can accurately spot cars without leaving his position.



Mirror assists operator in spotting quarry cars

Rewasher on the left, in foreground, with screening plant to the rear, sand washer in the center, and concrete silo for mortar sand storage, to the right

Unique Method of Handling Gravel from Barge to Bins

THE OHIO GRAVEL CO., of Cincinnati, Ohio and the Ohio River Sand Co., Louisville, Ky., recently worked together in filling a contract for 35,000 ton of sand and gravel for delivery at Aurora, Ind., to be used in building a three-mile 40-ft. concrete road.

Material was dredged and delivered to the job by the Ohio River Sand Co. Then the Ohio Gravel Co., placed a clam shell on a barge and unloaded the material into a bin on an adjoining barge next to the shore. A timber driveway was built from the shore to this barge which allowed trucks to go aboard and load from the bin, taking the load ashore to a stock pile. On shore cranes loaded batching bins from which trucks received dry batches of aggregates and cement for transport to the job.

Clamshell on one barge unloads sand and gravel from transport barges to bin located on barge anchored near the shore

Keeping Belt On Pulley

OHIO ASPHALTIC LIMESTONE CO., New Vienna, Ohio, operates the major equipment in its plant through a series of flat belt drives and line shafts. At the 24-in. roll crusher, driven from a line shaft, there was considerable slippage of a 10-in. flat belt and it was often thrown off a 40-in. diameter pulley.

A pulley with a wider face was substituted and a 12-in. belt for the 10-in. belt was placed on it with a 6-in. flat belt on top of the 12-in. belt. While it

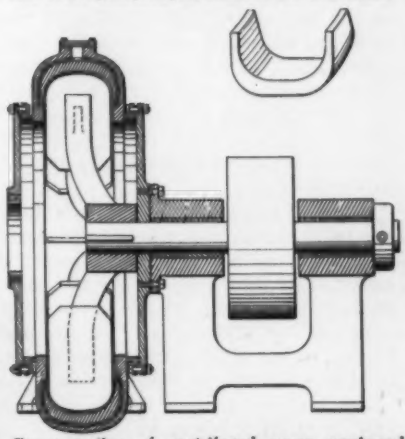
Two belts over wide faced pulley prevent slipping

is difficult to account for it, there has been no slippage and no throwing of belts since the experiment was tried. The belts have the same tension as the 10-in. belt. No belt dressing is used.

Lining Centrifugal Pumps to Resist Abrasion

AN INVENTION of John A. Buechler, well-known in the sand gravel industry of the South, should be of general interest. It consists of abrasion-resisting liner sections wedged into a U-shaped recess in the casing of the centrifugal pump. Each sector of the lining has thinner side walls than those portions in which pressure and velocity are the greatest.

A novel and important feature of the invention, which has been granted patent No. 2,121,068, is said to be the manner of positioning the liner within the casing to resist the stresses that may occur during the normal operation of the pump. The sectors of the lining are introduced in sequence into the recess of the mouth of the discharge outlet until a complete liner is provided. Sectors are inserted in the recess of the casing in end-to-end relation and are moved to the farthermost end of the recess. Each of the sectors is then wedged inwardly to bring the faces of the sectors against the shoulders in the casing walls. The casing is then oriented so that liquid will flow by gravity into the annular space between the sectors and the casing.



Cross section of centrifugal pump equipped with abrasion-resisting liner. Upper right: Cross section of one of the sectors

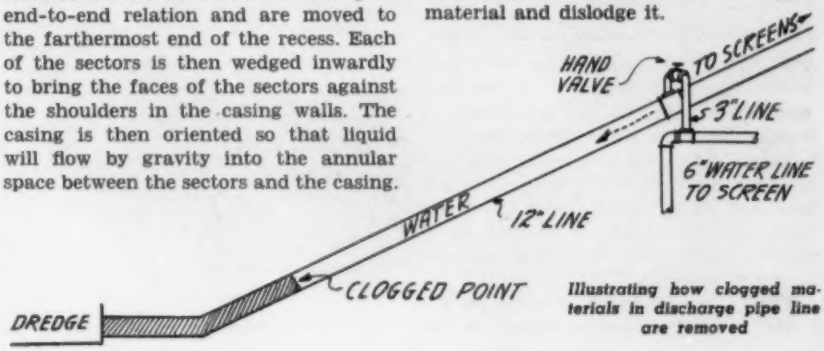
A suitable metal of relatively low melting point, such as brass, zinc, or bronze is then put into the annular space to form the bonding metal to retain the sectors in place within the casing. A second group of sectors is then inserted and the casing is again oriented so that bonding metal may be poured behind the lining sectors to fix such sectors in place. This sequence is repeated until a complete liner is provided within the recess of the casing.

Dislodging Clogged Materials in Pipes

UNITED SAND AND GRAVEL CO., Morrisville, Penn., operating a 12-in. Morris sand and gravel pump, has installed a device to assist in dislodging clogging materials in the discharge pipe line.

Near the point where the inclined pipeline discharges to the rotary screen, a 3-in. pipe connection has been made between the 6-in. water line and the 12-in. gravel line, and provided with a hand valve.

When the pipe line clogs, the valve is opened, allowing the pipe to fill with water above the point of the obstruction. The weight of the column of water above the clogged point, plus the pulsating action when the pump suction is varied from a maximum to a minimum serves to cut into the clogged material and dislodge it.



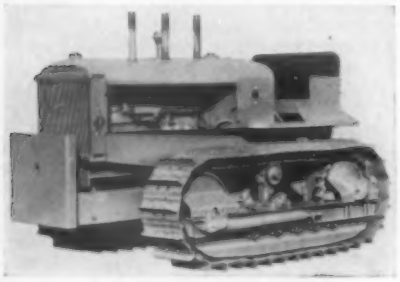
Illustrating how clogged materials in discharge pipe line are removed

NEW MACHINERY AND EQUIPMENT

Bumper-Equipped Tractor Increases Scraper Yardage

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., has designed a front-end bumper for its Model L-O tractors to be used for pushing tractor-scraper outfits while loading.

Time studies on several jobs, it is claimed, show they increase payloads, cut loading time and raise the daily output per scraper. Tractor repair costs it is expected will be reduced by relieving the pulling tractors of much of the twisting and jerking strains customary to loading. It is believed the use of the pusher will cut down operator fatigue by reducing the amount of gear shifting and steering clutch work now required to load scrapers where no pusher is used.



Tractor equipped with bumper for pushing tractor-scraper outfits

The bumper is spring cushioned and mounted inside the truck frames so that the push is on the rear end of the tractor. The bumper has a face, 36- x 32-in. to permit contact with the scraper bumper without shock.

Air-Cooled Magnetic Pulley

THE STEARNS MAGNETIC MFG. CO., formerly Magnetic Mfg. Co., Milwaukee, Wis., has made several improvements in its high duty magnetic pulley.

To allow for greater radiation area, a ribbed construction has been designed, including deeper coil pockets which allow for more copper wire and more ampere turns with subsequent greater magnetic strength.

The system of specially designed air ducts, which has been a feature of the Stearns magnetic pulley since its inception, has also been improved. The coil windings, it is claimed, are more efficient due to greater cooling area furnished by the forced air circulation which is caused by the compressive action of the belt that forces the cooled air into the ribbed interior of the pulley on the upper side and expels the heated air by the suction of the belt on the lower side.

Another feature of the improved magnetic pulley is the non-magnetic end rings of special alloy steel which extend beyond the active face of the pole and are machine fitted to the end poles. These heavy non-magnetic wear resisting end rings provide a support for the unloaded edges of the belt at either side and confine the magnetic force of the pulley to the active portion of the belt.

The one-piece magnet body is held firmly in fixed position on the alloy long wearing steel shafts by extra heavy steel hubs, welded to the supporting arms and keyed in position abutting the shoulder of the oversize portion of the shaft, thus providing for rigid and substantial construction.

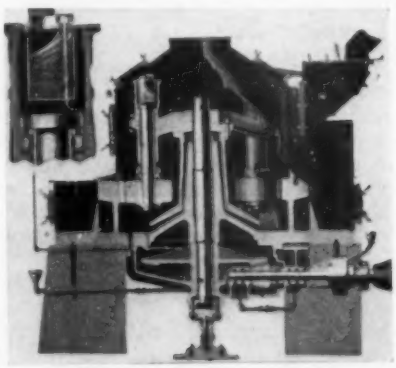
Drilling Machine With Shock Absorber

THE STAR DRILLING MACHINE CO., Akron, Ohio, is now in production on an all-steel drilling machine, known as the No. 75 spudrill, with anti-friction bearings, free running reels, air-cooled brakes and a shockless spudder. It has a capacity to drill up to 3500 ft.

An all-steel drilling machine with complete anti-friction bearing equipment would not be possible, it is said, without means of absorbing the shock caused by the drilling operation. About four years ago the Star shockless spudder was designed and incorporated into a small water well machine. The experience gained by observing many of these machines, plus a number of practical experiments carried out in the field, have resulted in the development of the built in shock absorber.

Centrifugal Oil Lubricator for Roller Mill Journals

THE TEXAS CO., New York, N. Y., has announced that their centrifugal oil lubricator, designed for application to Raymond roller mill journals to take the place of grease lubrication, is now available for outright purchase. Heretofore these units were not sold but were distributed on a rental basis.



Cutaway view of roller mill showing application of centrifugal oil lubricator

These lubricators, it is claimed, have effected savings in lubrication costs as high as 65 to 90 percent in pulverizing coal, gypsum, limestone, phosphate rock, and other minerals. Other claims made for this lubricator include: a reduction in power cost, elimination of

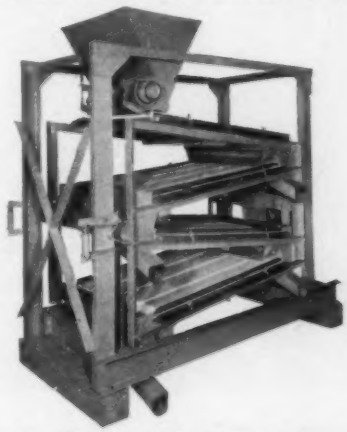
Drill with air-cooled brakes and shockless spudder

product contamination, increased operating hours through a reduction of shut-down time for lubrication, a reduction of roll journal temperatures, and decreased mechanical wear.

Lubricator design has been adapted to fill the space formerly used as a grease reservoir. It is said to be easily installed in the upper end of the roll housing, and the flanges of the lubricator replace the cover or plug at the top of the housing. The pressure necessary to raise the oil to the top of the metering tube is produced by centrifugal force. The tube is of such a diameter and length that it measures and delivers the right amount of oil necessary to lubricate the roll journal and its bearings.

Multi-Form Grader

THE EXOLON CO., Blasdell, N. Y., developed a machine for grading abrasives for its own use which is now available for other users. Department of Commerce standard grades are produced, it is claimed, at the rate of 5000 lb. per



Grader which is designed to handle dry, granular material from 4 to 250 mesh and at a rate up to 5 tons per hour

hour; coarse splits are made at 10,000 lb. per hour; and fine splits somewhat slower. A producer of ceramic materials splits a run-of-mill material minus 20 plus 40, and minus 40, at from 12,000 to 14,000 lb. per hour, the splits going to high-intensity, magnetic separating equipment, also made by the Exolon Co.

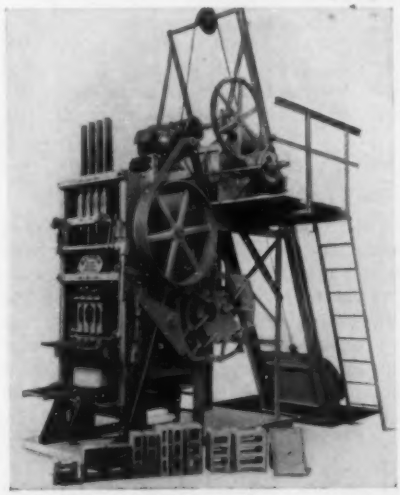
If fed a run-of-mill product, the unit illustrated delivers three finished grades, or four, if the head feed is scalped. Additional units can be placed above, below or in series to provide any needed additional capacity. If desired, the material can be taken off in splits, rather than grades, at a faster rate of speed. The feed can be controlled by changing size of opening in feed hopper by a hand wheel. Dry, granular materials from 4 to 250-mesh can be handled with this machine.

To give the screen a vibratory motion, a recently developed drive is employed, the motion being regulated in its throw to suit different grading requirements by a simple adjustment of revolving weights. The vibrator speed is from 500 to 100 r.p.m.

The machine illustrated is 6 ft. 6 in. long, 4 ft. 4 in. wide, and 5 ft. high. Screen surface is 27½ x 34 in.

Plain Pallet Stripper with Mixer Mounted Above

BESSER MANUFACTURING CO., Alpena, Mich., has announced the Besser Champion plain pallet stripper. This ma-



Plain pallet stripper operated with only two simple controls

chine in two models, has been in operation in a number of plants since early Spring, but this is the first formal announcement. Like other Besser models, the Champion makes all units on one set of plain steel or wood pallets.

Tamping is by power controlled with a hand lever. Feed, strike-off and stripping are power-operated and actuated by a single cam controlled with the foot. None of the power functions —feeding, tamping, striking-off and stripping—are automatic, yet the machine is operated with only two simple controls.

The model shown in the illustration is all power operated, with direct motor and vee-belt drive. In the complete "Unitized" set-up, a 12-ft. mixer is mounted over the machine. The mixer and skip loader are operated with a separate direct motor drive. This model has a production capacity of 1500 full size units per day. The Champion is also made in a model with power tamping, power stripping and hand feed, hand strike-off with a production capacity of 1000 full size units per day.

Bag Handling Conveyor

CLARK TRUCTRACTOR, Battle Creek, Mich., is now marketing a portable, flexible, power-driven conveyor and stacker, known as the Clark RopeVeyor. This equipment handles unit loads up to 250 lbs., in cotton, jute or paper bags. It is claimed to be capable of reducing handling costs to 10c per ton.

It is designed to operate at speeds of 66 ft., 96 ft. or 132 ft. per minute, handling up to 75 tons per hour, depending upon the number of men at loading and discharge ends.. It is said to be particularly efficient in conveying and piling bagged material, such as cement, lime, and gypsum.

The equipment is made up of 8-ft. sections coupled together and driven by a power head which may be placed at either end of the line or between any two sections, in no case interfering with the smooth flow of material. One power head serves six sections, comprising one assembly, and any number of assemblies may be connected together to form a conveyor of any desired length. Sections are mounted on 3-in. swivel casters, making the whole assembly mobile. Universal joints and clearances between sections permit a turn between sections of as much as 15 deg. so that three such changes of direction achieve a right angle turn.

Handling bags of cement with conveyor built in 8-ft. sections and coupled together

NEWS about People

ARTHUR ROEDER, president of Colorado Fuel and Iron Corp., has been elected a director of Alpha Portland Cement Co., Easton, Penn. Mr. Roeder fills the vacancy caused by the death of J. H. Lockhart, Pittsburgh, Penn.

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C. J. LARKIN, president of the Rock Island Sand & Gravel Co., Rock Island, Ill., recently celebrated his 86th birthday. To Mr. Larkin, a veteran in the sand and gravel business, is extended the congratulations of the industry. In addition to his identity with the rock products industry, Mr. Larkin is also actively interested in other industries and civic affairs.

•

JACK DEMPSTER, genial and popular Editor of the Cement and Quarry Section (Safety) News Letter, was honored

Jack Dempster, veteran News Letter Editor and the Cement and Quarry Section

by a "Jack Dempster Centennial Dinner" staged by his friends at the Palmer House, Chicago, on October 11. The "Centennial" idea was introduced to wish Mr. Dempster well for another 100 years as editor. Mr. Dempster is safety director of the Canada Cement Co., Ltd., Montreal. Fifty leaders in the Cement and Quarry Section of the National Safety Council were present.

•

ROBERT H. ENGLE, formerly with the Quality Lime Institute, has accepted the position of assistant agronomist with the National Fertilizer Association.

John Odenbach Shipping Magnate!

Some of us old-timers in the rock products industry remember 'way back when John H. Odenbach bought a little crushed stone plant on the outskirts of Rochester, N. Y., which was trying to exist on an agricultural limestone business exclusively. John didn't know anything about quarrying or crushed stone, but he was a good business man and a natural born mechanic. In a very short time there wasn't much about the crushed-stone business he didn't know; and having come into it without any preformed biases, he soon began violating conventions in both operation and merchandising.

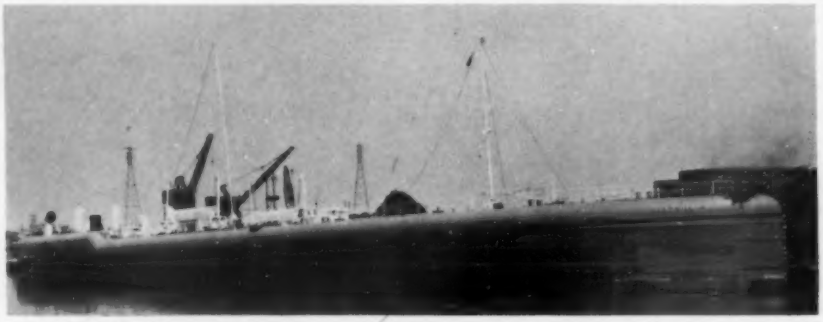
From agricultural limestone, the Dolomite Products Co., for that was its name, grew to include all kinds of crushed stone, concrete products, a gasoline filling station, sand and gravel plants, gypsum rock, a highway contracting business and finally a shipping business. Nothing John Odenbach did was quite like what others in the same business did.

His first Great Lakes Barge Canal ship, the *Dolomite*, had the first all-welded hull of its size. We might make a long story about that because we know John first became interested in welding possibilities by experimenting with truck bodies in his quarry—he was one of the first to introduce truck transportation in the quarry. The original *Dolomite* made a real dent in the shipping industry.

Recently, John followed with the *Dolomite IV*, illustrated herewith, which is notable for at least two things: (1) she was never "launched", but was built in a long-unused spur of the Erie Canal near Rochester, N. Y., and floated out by siphoning water into the lock; and (2) her hold is lined with pure nickel, which will permit the carrying of liquid

John H. Odenbach

or solid cargo. On her maiden trip to Chicago, she hauled bulk kerosene and returned with a load of wheat, the nickel lining being easily and rapidly cleaned out by steam jets before making the change. After the close of fall navigation on the Lakes the ship will be used for transporting corrosive chemicals.



John Odenbach's newest ship, Dolomite IV, whose name shows his attachment to the rock products industry

To John Odenbach and his many friends in the crushed stone industry the name *Dolomite* has a significance that is lost on his new associates in the shipping world. It shows that John still retains a soft spot in his heart for a quarry on the outskirts of Rochester.

•

FRANK TEJAN of the Frank Tejan Stone Quarry, Dayton, Ohio was recently injured severely in an automobile accident.

•

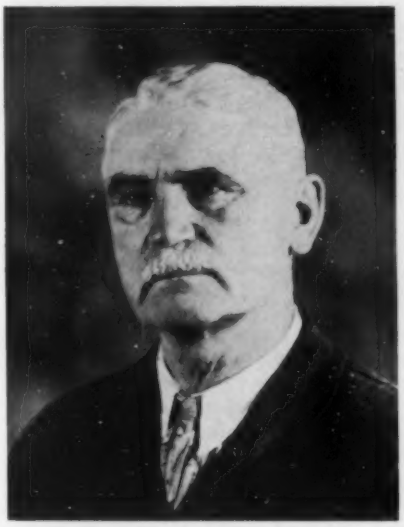
F. T. BROWN, sales manager of the Lehigh Portland Cement Co., Kansas City, Mo., was a recent speaker before the Topeka Optimist Club.

•

ELMER SUNDSTROM, superintendent of the Lyman-Richey Sand & Gravel Co., Plattsmouth, Nebr., has become head of the Cass County Recreation Center and will take a year's leave of absence to devote his full time to this work.

•

JOHN A. BUECHLER has been appointed superintendent of the Monroe Sand and Gravel Co., Monroe, La., succeeding the late H. C. Miller who was killed in an airplane acident. Mr. Buechler, a native of Oxford, Mich., has been engaged in the sand and gravel business for many years. In 1932 he was sent to Franklinton, La., to rebuild and electrify the Walter Green gravel pit. He superintended production of all the sand and gravel used in erection of the Huey P. Long bridge in New Orleans and later was superintendent of the Saxet Sand & Gravel Co., Victoria, Tex.



John A. Buechler

In addition to his sand and gravel interests, Mr. Buechler is the owner of a 320 acre farm on 200 acres of which he has planted 12,000 tung oil trees. He states that he "expects to harvest some crop next year and develop the entire 320 acres into a farm and home to go to when he gets tired of scratching sand and gravel."

•

EDWARD E. MILLS, district manager for Northeast Ohio, and Keith H. Dutchess, plant superintendent, were the men mainly responsible for the perfect no accident record in 1937 of the Massillon, Ohio, plant of the American Aggregates Corp., Greenville, Ohio. This plant was the winner of a ROCK PRODUCTS certificate of merit for its splendid record in the contest conducted by the U. S. Bureau of Mines in coöperation with the National Sand and Gravel Association.

Edward E. Mills, left, district manager, and Keith H. Dutchess, superintendent, the men behind American Aggregates Corp. perfect safety record at Massillon, Ohio

Mr. Mills started in the gravel business 30 years ago in Greenville, Miss., and came to the American Aggregates Corp. in 1923. He has been in active charge at Massillon for the past seven years, after having spent five years and three years respectively at the company's Urbana, Ohio, and Brighton, Mich., plants. Winning recognition for safety is not new to Mr. Mills, he having been in charge of the Brighton, Mich., plant in 1929 when it was honored with the first trophy offered in the contest for a perfect record. In that year the plant produced 2,000,000 tons of sand and gravel.

Mr. Dutchess has likewise had long affiliation with the company, having spent 13 years with the organization before being promoted to the superintendency in 1936. His previous experience had all been in the office. Both of these men have given considerable study to conditions which cause accidents and have the full coöperation of their men.

•

H. O. Rinehold, plant manager of the San Antonio Portland Cement Co., San Antonio, Texas, has resigned.

Obituaries

JAMES H. MACDONALD, generally attributed to be the "father of American good roads," died September 22, in New Haven, Conn., at the age of 87. "Uncle Jim," as he was known affectionately by thousands of admirers, was one of the country's pioneer highway engineers. He was the first highway commissioner of Connecticut, and served in that capacity from 1897 to 1913. Mr. MacDonald was a charter member and treasurer of the American Road Builders' Association.

•

OSCAR J. LINGEMAN, formerly vice-president and general manager, Aetna Portland Cement Co., Detroit, Mich., died in Pasadena, Calif., where he had lived after retiring from office two years ago due to ill health.

•

LOVELL H. CARR, a retired executive of Alpha Portland Cement Co., Easton, Penn., died recently at the age of 72. He retired in 1932 after 28 years of service.

•

CLAYBORNE S. BLACK, identified with the cement industry in Pennsylvania for 25 years, died recently in Philadelphia as the result of a stroke. Mr. Black, who was 52, has been associated with the Lawrence Portland Cement Co., Philadelphia, Penn.

•

JOSEPH D. BAKER, one of the founders of the Standard Lime and Stone Co., Baltimore, Md., and widely known throughout the lime and crushed stone industry, died at the age of 84. Mr. Baker was also a director of the Washington Building Lime Co., and the Baltimore & Ohio Railroad. In addition to his activities in the rock products industry, Mr. Baker was associated with several large banking institutions, real estate, and railroad enterprises.

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WILLIAM W. JOHNSTONE, president and manager of the Olympia Concrete Products Co., Olympia, Wash., died October 8. Mr. Johnstone was 50 years old.

•

FRANK S. WHEELER, well-known in the phosphate industry of Mt. Pleasant, Maury county, Tenn., died recently at the age of 61. Mr. Wheeler came to Tennessee 40 years ago from Vermont.

Study Industrial Minerals

(Continued from page 47)

nearly all of one session was given over to papers and discussion on mineral aggregates, as explored for, produced and tested by the Tennessee Valley Authority.

The first paper, "Methods Used in Prospecting for Mineral Aggregates," by Edgar R. Kendall, dealt with methods in solving the problem of locating economical sources of aggregates for concrete work on T. V. A. projects. The very first step is to explore existing commercial sources; and examination of structures built with aggregates from these sources is fully as important as any physical tests applied to the aggregates in determining their quality. A large part of the paper dealt with methods employed to sample river sand and gravel bars, first by driving a 4-in. steel pipe into the river bed, using a pile driver and depending on the material brought up inside the pipe, when it was pulled out, for samples; this proving unsatisfactory a 24-in. pipe was sunk into the river bed by excavating the interior with a small orange-peel bucket. The method is not new except possibly for sampling river deposits. The cost in this case was 67c per ft.

Tests for size were made on the barge. The samples were then sent to the laboratory for determination of soundness, quality and size gradation.

For sampling rock deposits an ingenius scheme of using colored pins to represent core-drill holes has been used.

Questioned in regard to soundness tests, Mr. Kendall said these consisted of both sodium sulphate and freezing-thawing tests; concrete made of the aggregates was also tested for soundness.

W. E. Cate, of the T. V. A., discussing "Durability Studies of Aggregates," said that their problems arose largely from the fact that in many cases the most economical sources of aggregates often had no previous service records; therefore the sodium sulphate and freezing-thawing tests were the sole criterion in selecting one aggregate as against another. Nevertheless they had determined no fixed limits that could be applied here or elsewhere. The tests were merely aids in "judging" the aggregates There was no consistent general relationship between the sodium sulphate and the freezing-thawing tests; failure to withstand a reasonable number of cycles in either case was cause for suspicion of the aggregate.

Mr. Cate said that fine grained limestone showed up best; that chemical composition of the stone did not seem important, it was more a matter of the physical structure. Loss in concrete specimens from freezing and thawing tests was due chiefly to breaking down of the bond between the aggregate and the cement. A 25 percent loss in concrete specimens was considered cause for rejection of the aggregate regardless of the number of cycles. Mr. Cate said that drill cores from existing concrete structures were not comparable with cylinders molded in the laboratory so far as freezing and thawing tests were concerned.

Hiwassee Dam Aggregates

"Production Methods at Hiwassee Dam Aggregate Plant," was the subject of a paper by F. Cadena, T. V. A. engineer largely responsible for its design and erection. His paper brought out much interesting and helpful data on operation, not included in previously published descriptions of this plant. For example, he emphasized the importance of the intermediate storage and surge bins. The primary crushing unit operates 3 shifts, the rest of the plant only one, but the plant is so designed that a steady feed can be maintained for optimum capacity throughout the plant.

Another point emphasized by Mr. Cadena was the successful use of hammer mills using an abrasive material—a rock containing 65 percent silica. Hitherto hammer-mill manufacturers have not recommended hammer-mills for tough or abrasive rocks. This rock is not tough but quite friable; nevertheless it is extremely abrasive. In terms of power consumption only one-third of that required at the Norris dam to crush dolomite is necessary; in terms of wear on the hammers and plates, there is three times as much.

Ready Mixed Concrete

(Continued from page 48)

ber 26; present were H. F. Thomson, chairman, St. Louis, Mo.; C. F. Ball, Chain Belt Co., Milwaukee, Wis.; T. H. Fleming, Mixer Transport Co., St. Louis, Mo.; Lion Gardiner, Jaeger Machine Co., Columbus, Ohio; J. F. McCracken, Louisville, Ky.; R. M. McLean, Transit Mixers, Inc., New York City; Stanton Walker, secretary of the committee, and as visitors, S. A. Phillips and Nathan C. Rockwood.

Among the subjects discussed were the revised A. S. T. M. standards for ready mixed concrete; "volume-change" studies; the field the association should cover in regard to standardization of equipment. No very definite action was taken except crystallization of the idea that research should be an essential part of the association's activity. As usual in such discussions the source of the necessary funds was the bone of discussion, with no positive action taken. Nor was any definite action taken regarding writing standards for other than truck mixers and agitators of the revolving drum type, for which standards have already been drawn up and published.

The board of directors of the National Ready Mixed Concrete Association met at Washington, D. C., September 27; those present were James F. McCracken, Louisville, Ky., president; Alex. Foster, Jr., Philadelphia, Penn.; H. F. Thomson, St. Louis, Mo.; V. P. Ahearn, and Stanton Walker, Washington, D. C.; visitors were Lion Gardiner, Columbus, Ohio; T. H. Fleming, St. Louis, Mo.; S. A. Phillips and Nathan C. Rockwood, Chicago.

The board received the reports of the technical committees and of the administrative officers of the association. Plans for the coming annual convention at Cincinnati, Ohio, January 25-27, 1939, were discussed in considerable detail.

Executive Secretary V. P. Ahearn gave his understanding of the applications of the federal wage and hour law, the wage determination proceedings under the Walsh-Healey Act., a digest of the report of the President's Commission on Labor Relations in Great Britain and of the activities of the Temporary National Economic Committee (of the U. S. A.) A list of contracts made by ready-mixed concrete producers with various divisions of the federal government, which come under the Walsh-Healey Act, was distributed.

In response to a request by the administrator, Division of Public Contracts, U. S. Department of Labor, a panel of industry representatives was chosen to serve on the government advisory committee which will determine the prevailing minimum wages to be established under the Walsh-Healey Act. Those chosen to represent the industry at an initial informal meeting of the industry's representatives on the committee, Washington, D. C., October 14, were Paul P. Bird, Boston, Mass.; Joseph H. Dixey, New York City; Alex. Foster, Jr., Philadelphia, Penn.; Robert Lyons, Kansas City, Mo.; James F. McCracken, Louisville, Ky.; A. J. O'Connor, Detroit, Mich.; H. F. Pelsue, Los Angeles, Calif.; E. S. Simpson, Washington, D. C.; Stephen Stepanian, Columbus, Ohio; H. F. Thomson, St. Louis, Mo.; V. P. Ahearn, representing the association.

CONCRETE PRODUCTS and CEMENT PRODUCTS

Making Concrete Block By Vibration Method

Overhead Crane and Specially Designed Rack Handles 150 Block At Once

By R. S. TORGERSON

One of the most efficient concrete block plants in the industry was recently placed into production by the Midwest Concrete Pipe Co., Franklin Park, Ill. This company, which is widely known as a manufacturer of concrete pipe, decided to build a modern concrete block plant after the City of Chicago had incorporated concrete block in the new building code as an acceptable construction unit. The new plant is strategically located to serve the large Chicago market for building materials, being within a short trucking distance of all sections of the city.

Methods of handling block, kiln design, and curing are considerably different than the usual practices followed in manufacturing concrete masonry units. The arrangements for supplying aggregates and cement, mixing, and delivery to the block machine also represent careful planning to eliminate waste in labor and floor space.

Aggregates are received by rail and stockpiled adjacent to the plant where they may be easily transferred as needed to the timber bunker by a gasoline crane equipped with a clamshell bucket.

The bunker is divided into three compartments, each of which has a capacity of 50 cu. yd. Two of the compartments contain fine aggregate, passing No. 4 mesh, and one holds coarse aggregate, passing ½ in.

Below the bunkers are slide-gate controlled hoppers operated manually by a long lever. The hoppers feed into a welded steel buggy mounted on wheels which permits movement on angle iron rails to a point where the batch of 28 cu. ft. is dumped into a Stearns concrete mixer with a geared head motor. Cement and water in the correct proportion are then added to the mix. Bags of cement are stored conveniently in a room adjacent to the mixer.

When the batch is thoroughly mixed,

Welded steel batch buggy of 28 cu. ft. capacity is mounted on angle iron rails so that it may be easily moved from aggregate bins over to concrete mixer

it is dropped into an elevating skip loader, the lower end of which is below the floor level. The Stearns mixer also is located partly below ground level to allow for sufficient head room to bring the batch buggy over the mixer and reduce the labor required of the operator in dumping bagged cement.

The elevating skip loader carries the mixed concrete up to a steel hopper which feeds a Stearns Joltcrete machine. This block machine, a recently developed product, vibrates the concrete in the mold box while it is under compression, the vibration impulses

Left: Vibration type concrete block machine has a production of nine block per minute. Right: Rear view of machine showing inclined rails over which loaded skip of concrete is carried to hopper

Left: Looking down row of kilns, three of which are filled with blocks in steel racks. Note ropes leading down to top covers of kilns which permit drawing them up against the building wall when not in use. Right: A view from the exit end of the building, showing front covers of kilns and 5-ton crane in the background used for carrying 150 block in steel rack

being at the rate of 7200 per minute. There is a 15-second vibration cycle. Nine standard 8- x 8- x 16-in. blocks are made per minute, depending on the operating speed. Three blocks are made in one operation. Approximately 3500 standard blocks per 8-hr. day is the present capacity. Two men operate the machine. Various other sizes of block also are produced on this machine by making the necessary adjustments.

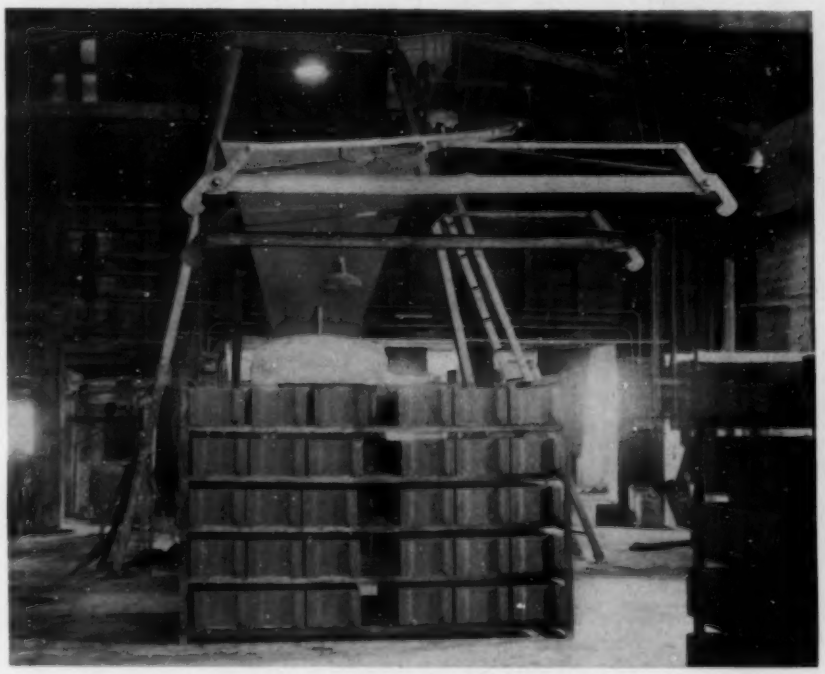
A lightweight aggregate, known as Pottsco, is generally used in making block, but sand and gravel and other materials also are employed to meet the demand for any kind of block desired. The mix comprises 50 percent of coarse aggregate, passing ½ in., and 50 percent fine aggregate, minus No. 4 mesh. The concrete mix is comparatively dry; about the same consistency as with the tamper type machine.

Special Steel Racks Facilitate Handling

As the blocks are taken from the machine on the pallets they are placed in specially designed racks made of 2-in. angle iron which hold 150 standard 8- x 8- x 16-in. blocks. These substantially-built steel racks serve a very important function in transporting the cement block from the Stearns Joltcrete machine to the steam curing kilns and from the kilns to outside storage. When a rack has been filled, a 5-ton overhead traveling crane is moved into position over the rack and a lifting device is lowered. This lifting device, shown in the illustration, was designed for the job and consists of a heavy steel frame with an I-beam across the center, the entire assembly being welded together. This beam has an eye welded to it which engages the hook on the crane hoist. Four tong-like hooks, one at each corner, are attached to the frame with a toggle arrangement to engage the corners of the rack holding the block.

One man can handle a loaded rack to the steam curing kilns with the aid of this lifting device and a 5-ton crane.

Steam curing kilns are located in the same building as the mixer and block machine, and are arranged as part of the scheme of straight line production. They are made with walls of concrete block to a height of 5 ft. 4 in. and extend back to the building wall, 16 ft. deep on one side and 10 ft. 8 in. deep on the other side, with an aisle between which will conveniently accommodate a loaded rack being moved



Lifting device being lowered from overhead traveling crane to loaded steel rack. One man can handle 150 standard concrete block into the kiln

into one of the kilns. There are six large kilns on one side of the building, each of which holds three racks of 150 block capacity, and 6 smaller kilns on the other side of the aisle, each of which holds two racks of 150 block capacity, a total capacity of 4500 block.

To enclose the kiln when curing block, a double-leaf hinged cover is let down over the top of the kiln walls by means of pulleys and ropes. When not in use, the hinged cover is drawn back against the building wall. The covers are made with a heavy wood frame over which sheet steel is fastened. At the open ends of the kilns, facing the aisle, a similarly constructed covering is placed in position and fastened to the ends of the concrete block by cleats provided for this purpose. As a further means of enclosure, a canvas is placed across the ends of the kiln.

Low pressure steam is then turned on to give the blocks a steam bath for a period of 24 hours. After the blocks in the racks have been subjected to steam curing for the required period, the covers are removed and the crane with its special lifting device removes the loaded rack to a small flat car mounted on a narrow gauge track located at the end of the aisle at the exit of the building. The loaded racks on these cars are easily pushed out into the storage yard where the blocks are removed and stacked. A portable roller conveyor is moved into position at right angles to the track to facilitate handling of the blocks in the yard.

Officers of the Midwest Concrete Pipe Co., are C. H. Bullen, president; J. R. Newell, vice-president; Robert A. Ubbelohde, secretary-treasurer; and Raymond Graber, plant superintendent. Mr. Bullen has been in the concrete product business since 1909, and Mr. Newell has been engaged in it since 1916.

The Grimm Building Material Co., Albany, N. Y., has taken over the Master Units Cinder Block Co., of Albany, and is now under full production, anticipating heavy demands this fall and winter. The company is making 4-in. partition blocks, the standard 8- x 8- x 16-in. block, and 12-in. load bearing block, together with chimney block. In addition to this new concrete products business, the Grimm company deals in cement, flue lining, lime, sewer pipe, plaster, roofing celotex, glass blocks, and wall board.

Clyde Richard of Big Rapids, Mich., recently purchased a concrete block manufacturing plant in Holland, Mich., and transferred the equipment to Big Rapids. The plant has a capacity of 500 blocks per day.

Ready Mixed Activities

Certified Ready Mix Concrete Co., Inc., was formed recently in Lewiston, Me., to produce and market ready-mixed concrete and to engage in the general manufacturing and contracting business. Ludovic Moreau of Lewiston is president of the company. Capital stock is 1000 shares of common stock without par value.

West Virginia Sand and Gravel Co., Charleston, W. Va., has been active in the sale of transit mixed concrete. Several large jobs recently have been completed, including the new Elk River bridge. Four Jaeger-equipped transit mixer trucks are operated.

Alabama Cement Products Co., Birmingham, Ala., has started manufacturing concrete bricks, using Superock aggregate. Superock is a slag aggregate which is a by-product from the local steel mills.

East Newport, Ark., will soon have a concrete pipe manufacturing plant which will be operated by the WPA. Construction of the building was sponsored by the county, which paid for the materials and the WPA furnished the labor. The pipe to be manufactured will be used in culverts.

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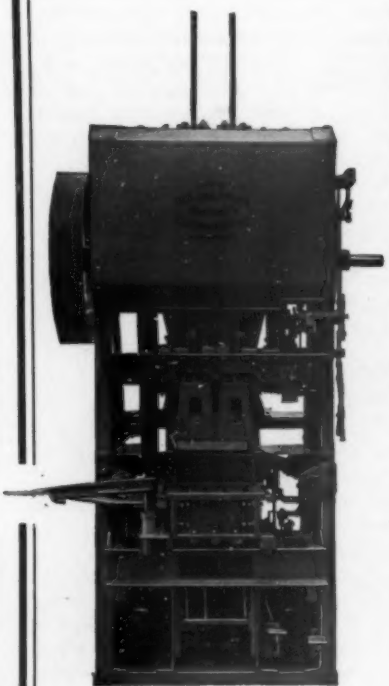


SUPER
TAMPER

Making Concrete Joists In the Kiln

Production Speeded Up In Filling Large Order for Joists

By BROR NORDBERG

No serious attempt had been made to merchandise concrete building units for above grade construction in Evansville, Ind., until early in 1938 when Concrete Supply Co., Inc., producers of ready-mixed concrete, began manufacturing concrete products. This concern was organized in 1935 and has consistently expanded until it now operates two ready-mixed concrete plants with 13 transit mixers and one of the most modern concrete products plants in the country.

Officials of the company recognized that the sale of high quality concrete block and precast joists would help to stimulate the demand for ready-mixed concrete—that very often a sale of concrete masonry could tie in a sale of transit mixed concrete—for foundations, for poured floor slabs or for some other purpose. Aside from that consideration, the fact remained that a city the size of Evansville had no superstructures of concrete masonry, used either for exposed surfaces or for backup. These markets are rapidly being developed.

Effective Merchandising Through Advertising

In the first four months of operation, 50,000 concrete units and 15,000 lineal feet of precast joists were sold, showing how effectively a well-organized sales force and properly-directed advertising program will function. The company is a believer in advertising and has constantly kept its product before the prospective home-owner, the architect and the builder. Every week its message appears on the advertising pages in the Sunday and Monday edition of the *Evansville Courier*, which feature a building and commercial page. This paid advertising is supplemented every three or four weeks by a story in the newspaper discussing some features and applications of joists and concrete block.

Salesmen who constantly contact the prospective builder are unusually well trained to sell concrete products, having been thoroughly equipped through their experience in selling ready-mixed concrete. "Precast Concrete Joists," "Concrete Floors" and other informative literature published by the Portland Cement Association are being used to advantage in familiarizing prospects with the products and their performance when used on specific types of construction.

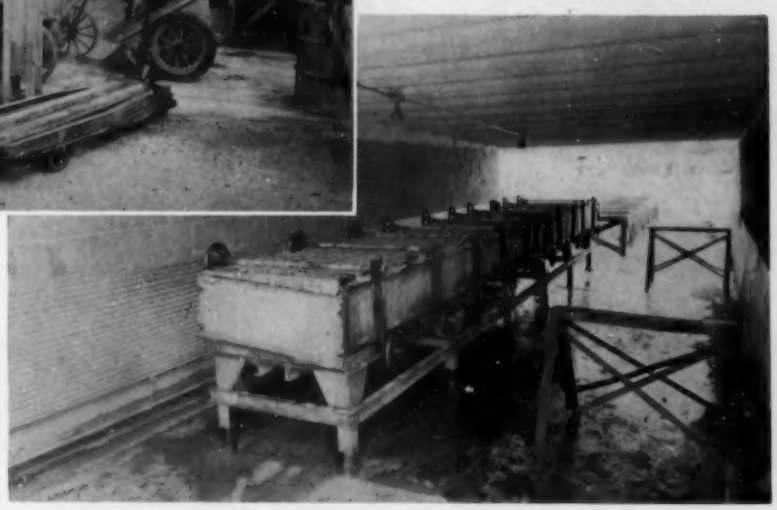
Of modern construction, the concrete products plant, which started operations in April, is probably the only one in the country built completely new in 1938. It is located in the company's city yard, and the buildings and ground are entirely distinct from the other operations.

Three aggregates, "Waylite" chilled blast furnace slag, cinders, and sand and gravel, are used to make whatever type unit the customer desires. Units manufactured are the standard 8- x 8- x 16-in. block and fractions thereof, bull-nose, corners and whatever others are needed for standard types of construction. The plant itself is of concrete masonry, steel and galvanized iron con-

(Continued on page 64)

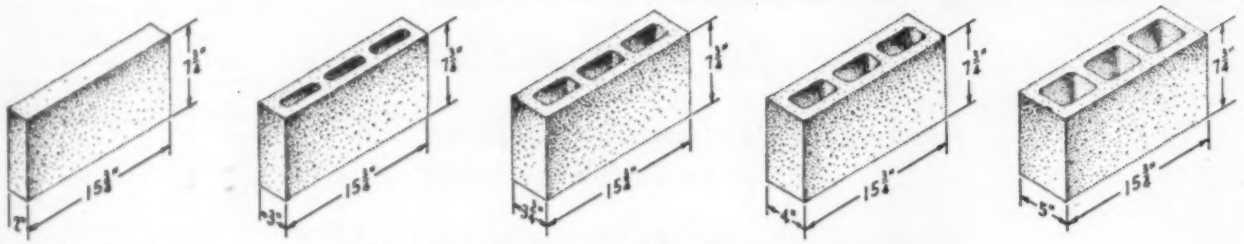
Above: Portable concrete mixer with buggies, shown to the right, for transporting concrete to the joist making machines. Block machinery shown in the background

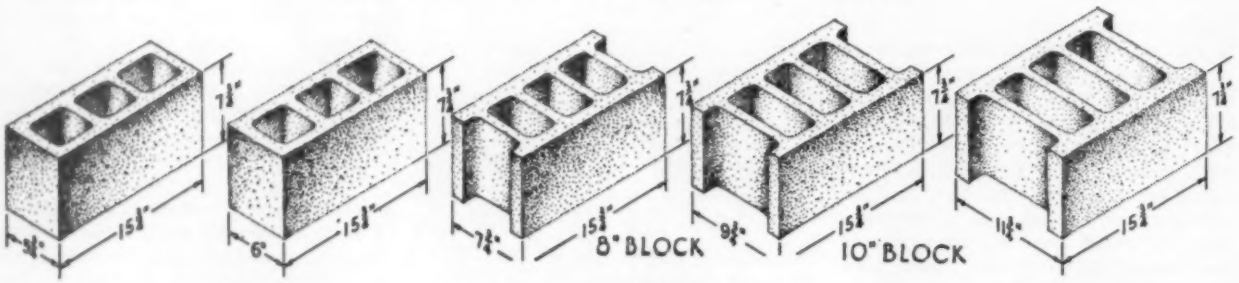
Below: Concrete-joist vibrating table located in kiln where the finished product is hot-air cured for five hours before transfer to table outside



BESSER STANDARD

Any Besser Plain Pallet Stripper makes all of these units, and many others, on ONE SET OF PLAIN STEEL OR WOOD PALLETS





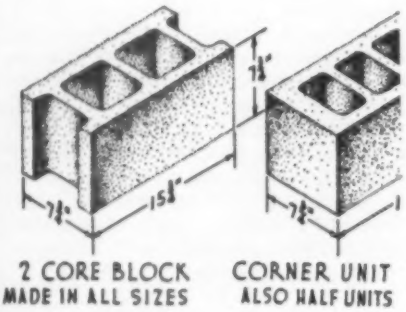
Protection and Benefits to the Industry

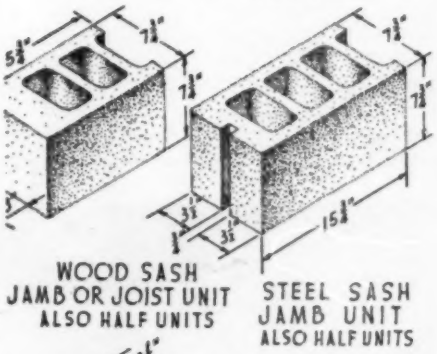
Besser Plain Pallet Strippers are made under one or more of the following patents, and patents applied for or pending, of which Besser Manufacturing Company is sole owner. No firm or individual is licensed or allowed to make machines under any of these patents.

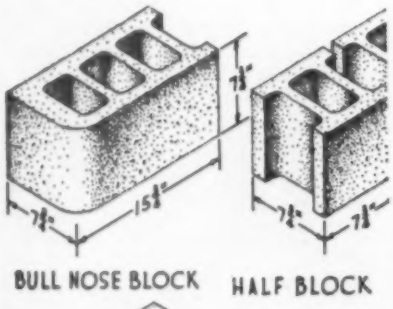
No. 1,472,399 by S. H. Pettengill
No. 1,572,305 by A. P. Nelson
No. 1,699,218 by J. H. Besser
No. 1,706,647 by J. H. Besser

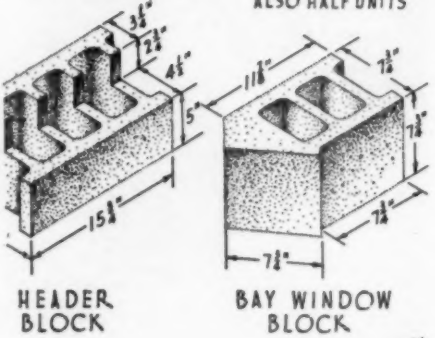
These patents cover the basic principle of suspending the cores above or within the mold, and block stripping means which makes possible the making of all sizes and types of concrete masonry units on ONE SET OF PLAIN PALLETS. All of these patents have been developed by Besser and as a result the industry has been greatly benefitted.

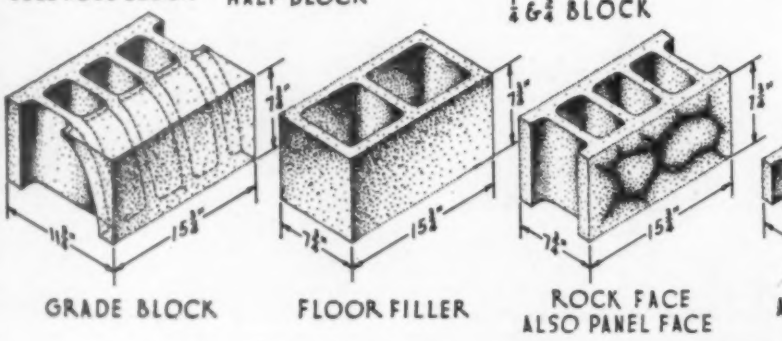
As a result of these inventions and original developments by Besser, concrete products plants have been completely equipped at greatly reduced cost, due largely to saving in pallet expense. Any new sizes the market calls for can be added without buying any new pallets.









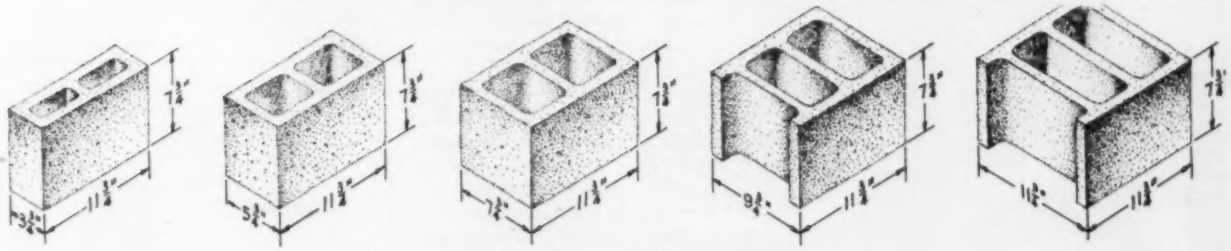


Any Besser Plain Pallet Stripper Will Make All of These Units and Many Others, on ONE SET OF PLAIN PALLETS

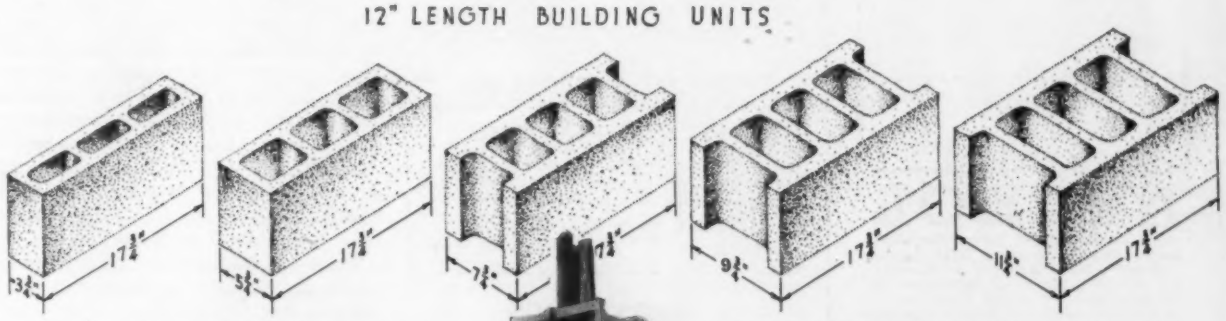
THE SAVING IN PALLETS MORE THAN PAYS FOR A BESSER PLAIN PALLET STRIPPER

BUILDING UNITS

Any Besser Plain Pallet Stripper makes all of these units, and many others, on ONE SET OF PLAIN STEEL OR WOOD PALLETS

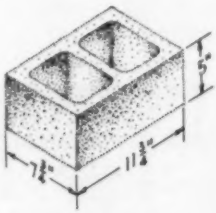


12" LENGTH BUILDING UNITS

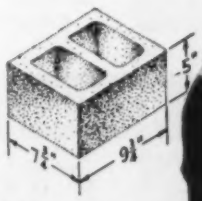


18" LENGTH BUILDING UNITS
(ALL ARE 7⅝" HIGH)

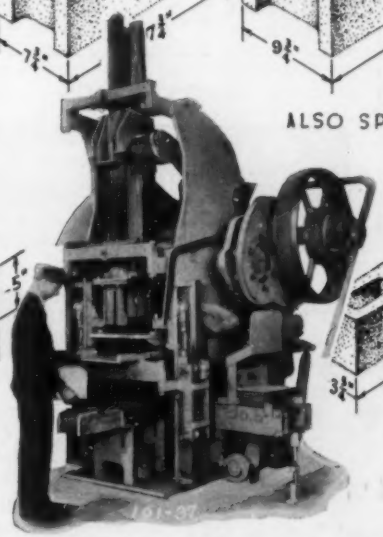
ALSO SPECIALS AS IN 16" LENGTHS

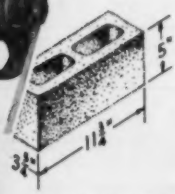


BUILDING TILE

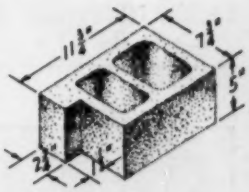


CORNER TILE

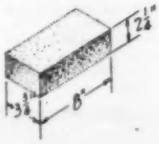




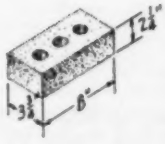
PARTITION TILE



WOOD SASH JAMB TILE



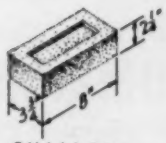
SOLID BRICK



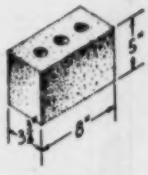
CORED BRICK

Besser Plain Pallet Strippers Made in production capacities for all plants from the largest to the smallest.
FULLY AUTOMATIC—3 Models—2000 to 4000 units per day.
SEMI-AUTOMATIC—4 Models—1000 to 2000 units per day.
POWER OPERATED with Hand Controls—2 Models—Capacities: 500 to 1000 units per day.
MULTI-MOLD—Hand Operated—up to 300 units per day. For manhole blocks, brick slabs, and small cored units.
AUTOMATIC BRICK MACHINES—10,000 to 50,000 units per day. For brick, slabs, coal cubes and other small units.

Ask for circulars and information. State production capacity wanted



SHALLOW FROGGED BRICK

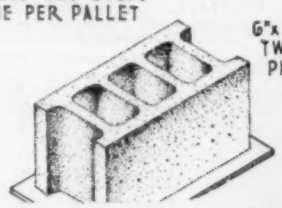


CORED DOUBLE BRICK

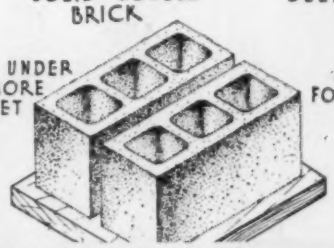
SOLID DOUBLE BRICK

DEEP FROGGED BRICK

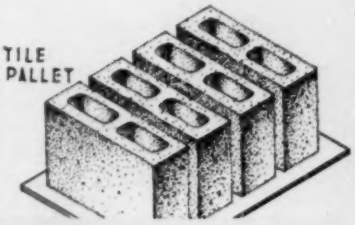
8"x16" AND OVER ONE PER PALLET



6"x16" AND UNDER TWO OR MORE PER PALLET



4"x12" TILE FOUR PER PALLET



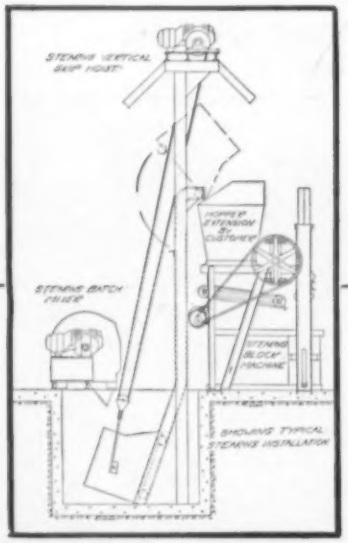
BESSER MANUFACTURING COMPANY

COMPLETE EQUIPMENT FOR LARGE OR SMALL CONCRETE PRODUCTS PLANTS

211 37th Street, Alpena, Michigan

Any Besser Plain Pallet Stripper Will Make All of These Units and Many Others, on ONE SET OF PLAIN PALLETS

THE SAVING IN PALLETS MORE THAN PAYS FOR A BESSER PLAIN PALLET STRIPPER



"ANCHOR"

Complete equipment for making concrete, cinder and other light weight aggregate units, including engineering service for plants and revamping of old ones for more economical service.
Hobbs block machines, Anchor tampers, Anchor Jr. strippers, Stearns power strippers, Stearns mixers, pallets, Straublox Oscillating attachments, etc.
Repair parts for Anchor, Ideal, Universal, Stearns, Blystone mixers and others.

Anchor Concrete Mchy. Co.
G. M. Friel, Mgr. Columbus, O.

struction, and is designed for installation of additional machinery and curing kilns as volume of business develops. At present the block-making machinery is being operated in the open, under a galvanized iron roof, but the building is to be enclosed for winter operation.

Waylite aggregate is shipped to the plant by rail in two sizes, ¼- to ⅝-in. and ¼-in minus. Sand and gravel are trucked from local river producing plants, and cinders are purchased from the Southern Indiana Power Co. and trucked to the bins. Cinders contain 1 percent sulphur and 3.96 percent combustible matter. Aggregate bins are partitioned side by side along narrow gauge track so that they can readily be placed in a travelling weighbatcher equipped with a 3-beam scale.

Manufacturing Methods

Block making machinery consists of a Stearns 8-bar, semi-automatic "Clipper" stripper with a capacity of 200 standard units per hr., a skip bucket which receives the batched aggregates, and a 12-cu. ft. Stearns mixer above the block machine.

In manufacturing sand and gravel block, the aggregate and cement are mixed together in the skip bucket, but in making lightweight units sacked cement is added directly into the mixer after the aggregate has been placed. Tests have shown these lightweight units to have 80 percent greater crushing strength as compared with others made from a batch in which the cement had been added in the skip bucket. This is of course due to the cement filling the cellular voids in the lightweight aggregate, when mixed in too intimately.

Units are manufactured with a comparatively dry concrete. Sand and gravel batches contain five gallons of water and lightweight concrete batches contain 5½ to 6 gallons. Water is taken from a city pipeline and introduced into the mixer through a perforated pipe, the volume being accurately measured by a Neptune water meter.

SPECIAL AGGREGATES

MICA CRYSTAL GRIT

A beautiful dark, sparkling granite material for cement facing, artificial stone and all cement articles.

MICA CRYSTAL CO., INC.
Dept. R Warren, N. H.

CEMENT COLOR

STAR and ANCHOR COLORS
Geo. S. Mepham Corp., East St. Louis, Ill.
C. K. Williams and Co., Easton, Penn.

CLOSE CLEARANCE PALLETS

A New Pallet Developed by
"COMMERCIAL"

Has all advantages of our regular PRESSED STEEL PALLET but with deeper embossed ribs, flatter edges.

Fits core box closer.

IDEAL FOR VIBRATING BLOCK MACHINES

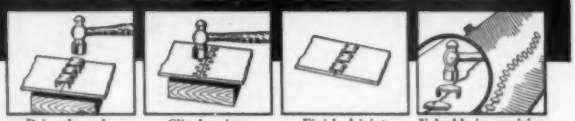
Now ready in following sizes:

3¾" x 16" — 50% air space
5¾" x 16" — 55% air space
8 " x 16" — 43% air space
10 " x 16" — 50% air space
12 " x 16" — 50% air space

For further information or prices
WRITE TO

The COMMERCIAL SHEARING & STAMPING COMPANY
YOUNGSTOWN, OHIO.

BELT JOINING MADE EASY!



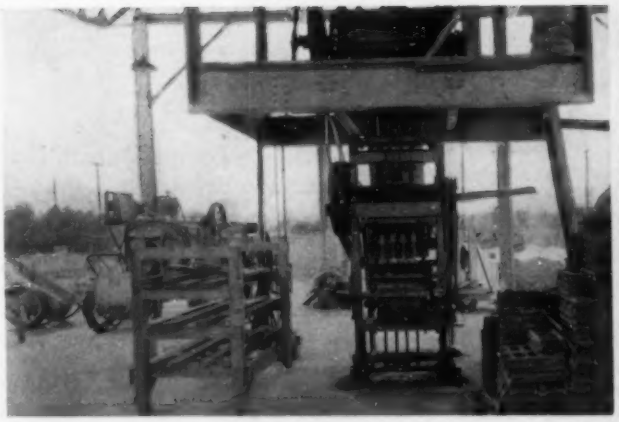
All you need to make quick joints on your belts or conveyors are a hammer, a block of soft wood,—and Bristol's Steel Belt Lacing. No need for special tools or experienced lacers. No need for costly shut-downs. Bristol's are available in sizes and styles for smooth, durable, lock-tight joints on any belt material and thickness from lightest split leather to ten ply stock. Full details in Bulletin No. 725. Write for it. THE BRISTOL COMPANY, Mill Supply Division, WATERBURY, CONN. Branches in Principal Cities.

BRISTOL'S

BLAW-KNOX TRUKMIXERS AND AGITATORS

The popular choice of contractors, engineers and users because they are built for a lifetime of dependable, economical service. They mix concrete faster and more thoroughly and produce high strength concrete of maximum workability. Completely described in the New Blaw-Knox Catalog No. 1582. Send for your copy today.

BLAW-KNOX DIVISION of Blaw-Knox Co.
FARMERS BANK BUILDING PITTSBURGH, PA.



Left: Front view of block machine with power plant above. Right: Skip hoist arrangement for elevating aggregates into mixer over stripper block machine. Portable weighing batcher operated on a track serves all aggregate bins

Units are cured for 24 hr. by low pressure steam in three 12- x 30-ft. kilns, followed by several weeks' air curing in the yard. Steam at 15 p.s.i pressure is forced through a 4-in. line into each kiln. A 2-in. coil is provided for heating and live steam is released for curing through perforations in the steam line spaced at 10-ft. intervals near the kiln floor. Strengths are developed to 1400-1500 p.s.i at 7 days, using high early strength cement exclusively in all units to facilitate early handling without breakage.

Concrete joists are manufactured in 8-, 10- and 12-in. depths on an R & L commercial vibrating machine, casting eight joists at once in lengths up to 25 ft. ½ in. Concrete used in making joists is mixed in a Koehring 1-bag, portable mixer and is delivered to the joist-manufacturing machine in rubber-tired concrete buggies. Great care is taken in operating the machine in order to eliminate water pockets. The concrete has a 7-in. slump, and is placed and spread manually in horizontal layers.

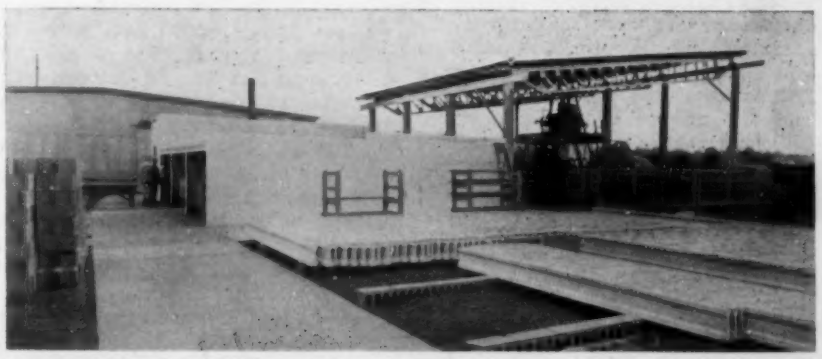
In making the joists by this method, a bed of concrete is placed in the gang forms to a thickness of 1 in. in the flange of the joist and vibration is applied for about 45 seconds. This process is repeated, with 3-in. layers through the web section, the entire operation requiring three minutes for eight joists. The machine has a variable amplitude and its driving mechanism is essentially an off-center shaft.

Forms are regularly coated with a paraffin form oil. To remove the glossy film which occasionally appears, the forms are rubbed down about twice a week with a rag soaked in common household vinegar. Vinegar has proven effective and is less injurious to the hands than some of the commercial preparations used.

Recently, the joist machine was mounted in one of the kilns so that a large rush order of joists could be filled on schedule. The order specified 10,000 ft. of 12-in. joists to be delivered in 30 days. In filling this order, a table was constructed of timber to the same dimensions as the joist table and set outside the kiln. Using high early strength cement, a gang of joists was cast in the kiln. The kiln was then closed up and heat, rather than steam, was applied for five hours, in order to keep the motors from getting wet.

After five hours, the separate channels were slid by four men from the joist table to the other table outside the kiln, where they were covered with wet burlap for an additional five hours. In this way, another set of joists could be manufactured sooner and none of the joists were lifted until they were 10 hr. old. The tearing down of the forms, resetting and pouring cycle consumes 3 hr.

Edgar Traylor is president and general manager of Concrete Supply Co., Inc. John Rudolph is secretary; Joe Traub, treasurer; and John Crisp is superintendent in charge of plant operations.



Above: View of plant with manufacturing section to the right, not yet enclosed; curing kilns to the left, and joists being air cured in the foreground. Note concrete drives for truck loading. Below: Showing how joists were handled in filling an order for 10,000 ft. of joists in 30 days on one machine. Vibrating machine was mounted in kiln

NEWS of the month

Sand Recovery Equipment Recently Purchased

THE MARSHALL SAND & GRAVEL CO., Marshall, Minn., operated by Hubert Deutz, has placed in service washing equipment to produce a better grade of sand and gravel and crushed stone. Recently, the company added equipment to recover fines at its gravel pit operations. This sand is suitable for plaster and brick mortar.

Higher Dam May Cause Damage to Sand Companies

CONSUMER SAND CO., AND KANSAS SAND CO., Topeka, Kans., now operating plants on the Kaw River above the dam, may have to suspend operations temporarily until railroad tracks and other facilities can be relocated when the height of the dam is raised 5 ft. by the North Topeka Drainage Board from whom the sand companies have leases.

New Haulage System

STANDARD CONCRETE PRODUCTS CO., INC., York, Penn., manufacturer of concrete products and cast stone and producer of crushed stone, is abandoning the trucking of stone in dump trucks from the quarry in favor of skip buckets and hand loading. One Dempster Dumpster hoisting unit on a Ford truck and six 2-ton buckets are in operation. The equipment is to be doubled to take care of the plant capacity of 500 tons per day.

Expand Sand and Gravel Plant Facilities

HOCKING VALLEY SAND & GRAVEL CO., Nelsonville, Ohio, which now has a capacity of 200 tons a day, is planning to add new equipment to this plant. A new reinforced concrete hoist building and hoppers are to be erected on an adjoining site to materially increase capacity. The sand and gravel deposit, which is said to be 60 ft. deep, covers many acres, indicating a sustained yield for a number of years.

PENRY STONE SAND & GRAVEL CO., Radnor, Ohio is installing a new 15- x 30-in. jaw crusher, an air compressor, and an 18-in. belt conveyor, 50-ft. centers.

INDEPENDENT SAND & GRAVEL CO., Newtown, Ohio recently started ready-mixed concrete operations. Five 2-cu. yd. Rex transit mixer trucks mounted on Ford chassis are used.

Rebuild Sand Plant

CAPE GIRARDEAU SAND CO., Cape Girardeau, Mo., has been completely reconstructed and all equipment has been replaced or rebuilt. Storage space has been increased, and materials conveyor has been lengthened. Manager Linder Deimund reports an excellent season for sand dredging operations. In addition to the sand dredging operations, the company also is finishing a gravel plant on the Scism farm north of the city, and will soon be turning out washed gravel.

Price War on Pacific Coast

SOUTHERN CALIFORNIA is witnessing a renewal of the cement price war which had been in abeyance for more than a year. Mill base prices were recently reduced 16c a bbl. and bids were cut as much as 25c. This drop in finished cement prices has followed a price war among sand and gravel producers and a cut in cement prices for delivery in southern San Joaquin Valley points, according to local reports. As a result of the price reductions, mill base prices went to as low as $1.15 a bbl., a level at which producers are thought to be operating at or near a loss.

Prices of cement in southern San Joaquin Valley points were revised through adoption of a zone delivery basis in place of the former mill base. Under the old mill base, cement prices were quoted at the mill, with freight to destination added. Under the zone basis, mills are reported to have set flat barrel prices for delivery to any point within fairly large zones. It is reported that this method has reduced cement prices in the valley area approximately 30c a bbl. No change in cement prices are reported by San Francisco dealers.

Another Sand Pumping Unit

NOAH CARROLL, Wakefield, Kans., is reported to have placed in operation a sand pumping plant on the Republican River. This project was planned a couple of years ago, but was not consummated until recently. Local contracts, it is said, will keep the plant busy.

WPA Using Large Quantities of Concrete Products

CONCRETE PRODUCTS valued at $32,275,000 were among the nearly $700,000,000 worth of materials of various types purchased for WPA projects in its first three years through June 30, 1938, according to statistics compiled from U. S. Treasury and WPA sources. This represents about 4.6 percent of the total purchases of $696,356,000. In nearly all cases, individual purchases were of comparatively small amounts for projects as the need for them arose, and the contracts usually went to dealers or manufacturers in the immediate vicinity of the project.

Cement purchases during the same period amounted to $58,405,000, a considerable part of which undoubtedly was used in the making of concrete products.

During the three-year period, crushed stone accounted for purchases totaling $35,244,000. Sand and gravel purchases amounted to $46,077,000. Other stone, clay and glass products involved orders totaling $27,448,000.

Option Taken On Gravel Land

P. D. SKILBECK AND FRANK P. MARINO, Racine, Wis., have taken a year's option to lease 25 acres on Root River near the Four Mile road, with the object of establishing a sand and gravel pit and erecting the necessary washing and screening facilities. The lease is reported to be for 20 years and the royalty to be paid the owners is 12c a cu. yd.

Expanding Rock Wool Output

NORTHERN ROCK WOOL CO., Pontiac, Mich., is planning to expand its output to 100 tons per week. Plans have been made for the installation of additional machinery so that production will be stepped up to capacity within the next few weeks.

ROCHE HARBOR LIME CO., Roche Harbor, Wash., is reported to have resumed operations after a short shut-down due to labor troubles. An agreement has been signed covering wages and working conditions.

GENERAL CRUSHED STONE CO., has moved the machinery of its Little Falls, N. Y., plant to South Carolina. This plant had not been in operation for several years. One of the reasons given for the discontinuance of operations was that the deposit was very hard syenite trap rock, difficult to blast and crush without incurring heavy expense.

Bids Taken for 95,000 Tons of Sand and Gravel

THE RECLAMATION BUREAU recently called for bids for 95,000 ton of sand and gravel to be used in constructing the Roza irrigation canal in the state of Washington, near Buena. Bids call for delivery in stockpiles at Buena over a period of 12 months after notice of award, and the maximum monthly delivery will be 10,000 tons.

Suit Against Railroad for Sand Rate Violation

ALLEGING that the Northern Pacific Railway Co. had violated the state law regarding discriminatory rates, the Department of Public Service of Washington recently filed a $2,122,000 penalty suit against the carrier. The suit charges that the railway violated rules of the department in 2122 instances, by charging smaller rates for transportation of property in intrastate commerce than the company's tariff on file with the department. The firm of Woodworth and Cornell, said the complaint, was charged less than the tariff rate for hauling of sand and gravel from Baker's spur to Pomona and Easton, for use on the Roza irrigation project. It is said that Woodworth and Cornell bought the sand and gravel from the Northwestern Improvement Co., a "wholly owned subsidiary of the railway."

Columbia Quarry Wins Safety Award Permanently

COLUMBIA QUARRY CO., Quarry No. 1, located at Krause, Ill., has taken permanent possession of the "Explosives Engineer Award" for safety as a result of winning first place in the National Crushed Stone Association safety contests for the years 1935, 1936, and 1937. The plant has continued to enjoy a clear accident record for this year, according to Superintendent E. A. Heise. This company completed its sixth consecutive year on September 22, without a lost-time accident. During this period there was a total of 1,148,134 man-hours worked with an average working force of 110 men producing 2,009,389 tons of crushed stone.

Government Abandons Cement Purchase Plan

CENTRALIZATION of all portland cement purchases by the federal government has been quietly dropped after six months of experimentation. Although no official announcement has been made, the Army has resumed its old practice of buying cement for large projects through its district offices, according to a news item in *Engineering News-Record*. It is also pointed out that the Interior Department has received a blanket clearance to handle its own contracts for standard portland cement. The Bureau of Reclamation will continue for the present to purchase special cements, but only those, through the Procurement Division of the Treasury.

The original plan was to secure prices f.o.b. a large number of mills in all sections of the country and to fulfill government needs, as they arose, by ordering from that mill which offered the lowest f.o.b. price plus delivery cost. When a large proportion of the cement industry refused to bid on indefinite quantities, the plan failed to work.

Following failure in this direction, the plan was to take bids on an f.o.b. mill basis for definite quantities, making a separate transaction out of the fulfillment of each requisition. While this arrangement worked out in the West, no bids were obtained in the East. It failed to function except in the case of large projects such as Grand Coulee Dam. With smaller projects, it became the custom to grant exemptions, permitting the federal agency concerned to buy directly without advertising through the Procurement Division. This practice became so prevalent that it was decided to eliminate centralized purchasing entirely.

Working force of Columbia Quarry Co., Quarry No. 1, Krause, Ill., responsible for winning permanent possession of the "Explosives Engineer Award"

Old Silica Plant Burns

ILLINOIS MINERAL CORP., Cairo, Ill., recently suffered the loss of the silica plant at Mt. Carbon, Ill., by a fire which swept through the abandoned buildings. The silica plant, the largest of its kind in the United States when constructed, was built by Isco-Bautz Silica Co. during the world war. Operations ceased at the plant a number of years ago.

Resume Production At Cement Plants

THE COLORADO PORTLAND CEMENT CO., Denver, Colo., opened its plant at Portland, Colo., for production on October 1. Ninety men will be employed for a 100-day run of the mill, and continued operation will depend upon shipments.

LONE STAR CEMENT CORP., New York, N. Y., started up its Hudson, N. Y., plant on October 1. Regular shipments plus extra shipments demanded for repair work after the recent storm in the east have been instrumental in causing an early resumption of activities. Early in October, the company was shipping cement to the eastern storm area as fast as it could be loaded, purchasers in Connecticut coming to the plant with trucks where railroad transportation had broken down.

LEHIGH PORTLAND CEMENT CO. has resumed production at its Metaline Falls, Wash., plant to supply cement for Grand Coulee dam. The plant has been closed about six months for overhauling, during which time new coal pulverizing machinery was installed. It is reported that heavy shipments are being made from both the Spokane and Metaline Falls plants, 10 to 12 carloads a day being shipped from the former and 10 cars daily from the latter plant.

THE MONARCH CEMENT CO., Humboldt, Kans., resumed production on September 28 after a shut-down since July 20. Repairs were made during the interim, and the shipping department remained active.

FIRE recently damaged the dredge barge of the Tennessee Valley Sand and Gravel Co., Sheffield, Ala. The amount of the damage has not been determined.

FINANCIAL NOTES

RECENT DIVIDENDS ANNOUNCED

Arundel Corp.	$ .25	Oct. 1
Calaveras Cem., pfd.	1.00	Nov. 1
Medusa Portland Cem., pfd.	1.50	Oct. 1
Northwestern States Portland Cem.	0.40	Oct. 1
N. Y. Trap Rock, pfd.	1.75	Oct. 4
Raymond Concrete Pile	.25	Nov. 1
Raymond Concrete Pile, pfd.	.75	Nov. 1
Riverside Cement	1.50	Nov. 1
Santa Cruz Portland Cem.	.50	Oct. 1
Schumacher Wall Board, pfd.	0.50	Aug.15
Westvaco Chlorine Prod.	.37½	Nov. 1

ALPHA PORTLAND CEMENT CO., Easton, Penn., reports for the 12 months ended September 30, 1938, a net profit of $109,866 after taxes, depreciation, depletion, etc., equivalent to 17c a share on 639,500 shares. This compares with $353,184 or 55c a share on 644,600 shares for the same period in 1937.

PACIFIC COAST AGGREGATES, INC., San Francisco, Calif., showed a net loss of $53,980 for the eight months ending August 31, 1938. Sales were $721,941; operating profit, $119,284; and depreciation and depletion amounted to $173,264.

LEHIGH PORTLAND CEMENT CO., Allentown, Penn., reports a net profit, after depreciation, depletion, obsolescence, income taxes, etc., of $487,232 for the 12 months to September 30, 1938, as compared with $1,289,928 for the same period a year ago. Earnings per share of preferred were $8.59 on 56,751 shares. Earnings per common share were 34c for the period ending September 30, 1938, based on 754,434 shares.

CONSOLIDATED ROCK PRODUCTS CO., Los Angeles, Calif., has enjoyed one of the best years in its history from the standpoint of sales, according to financial reports. Net income of the company for the eight months ended August 31, 1938, was $33,788.16 after all charges, including interest, depreciation, depletion and amortization. Sales for this period totaled $2,410,887 as compared with $2,337,822 for the same period in 1937. The company is now going through a reorganization.

SUPERIOR PORTLAND CEMENT CORP., Portsmouth, Ohio, has been named as a defendant in a foreclosure suit asking judgment for $241,500, recently filed by the Fifth Third Union Trust Co., Cincinnati, Ohio. The petition mentions that the bank is trustee for holders of bonds issued by the defendant company in 1927, all of which matured September 1, 1937, and are unpaid.

GYPSUM, LIME & ALABASTINE, CANADA, LTD., Paris, Ont., Canada, has shown improved sales in its lime and gypsum divisions, according to a report appearing in *The Financial Post*, Toronto. Sales of the gypsum division have been ahead of last year. The lime division sales for the first half of the year showed some curtailment largely due to a reduction of production in the pulp and paper industry which takes a considerable part of the company's output. Last year the company reported a substantial increase in profits and net was equivalent to 14c a share on the common against 9c in the year ended November 30, 1936.

PENNSYLVANIA-DIXIE CEMENT CORP., New York, N. Y., reports $43,213 consolidated net loss for the year ended September 30, against $104,244 profit, earned before federal taxes, in the preceding twelve months' period.

NATIONAL GYPSUM CO., Buffalo, N. Y., reports for the quarter ended September 30, 1938, a net profit of $355,505, after depreciation, depletion, interest, federal and Canadian income taxes, etc., equivalent, after dividend requirements on preferred stocks, to 22c a share on 1,261,458 shares of ($1 par) common stock. This compares with $199,900, or 10c a share, on 1,174,382 common shares in the same quarter of last year, and $283,328, or 17c a share, on 1,234,458 common shares in the quarter ended June 30, 1938. For nine months ended September 30, 1938, net profit was $751,008, equal to 41c a common share in the first nine months of 1937. Melvin H. Baker, president of the National Gypsum Co., estimated that earnings of the company for the third quarter were approximately one-third greater than for the same period last year.

UNITED STATES GYPSUM CO., Chicago, Ill., announced that the net income of the company was $1,607,725, or $1.23 a common share for the three months ended September 30, compared with $1,456,307 or $1.11 a share earned in the same period of 1937. It was the first time since the first quarter of 1937 that a current period's earnings exceeded results for the comparable period of the preceding year. For the nine months ended September 30, the company reported net income of $3,788,945, or $2.83 a common share, compared with $4,857,560, or $3.73 a share, earned in the same period a year ago.

NORTH-AMERICAN CEMENT CORP., New York, N. Y., reports a net loss of $882,334 for the 12 months ended September 30, 1938, after all charges, but before profit on bonds acquired, as compared with a net loss of $484,828 for the same period in 1937.

FLORIDA PORTLAND CEMENT CO., Chicago, Ill., with plant at Hookers Point, Fla., has reported a profit of $234,565 for the 12 months ended September 30, 1938, after charges but before federal income taxes. This compares with a profit of $113,987 for the preceding 12 months.

LONE STAR CEMENT CORP., New York, N. Y., reports a consolidated net profit of $805,585, or 84c a share, for the September quarter against $1,206,189, or $1.25 a share, for the same period in 1937. Net profit for nine months ended September 30, 1938, was $2,328,956, or $2.42 a share, against $3,130,627, or $3.24 a share for the corresponding 1937 period.

ONE OF THE LARGEST appropriations for a single highway project in the United States was recently announced when the PWA gave $26,100,000 and the RFC loaned $35,000,000 to the recently appointed Pennsylvania Turnpike Commission to build a 162-mile superhighway from Harrisburg to Pittsburgh. Contracts for 10-mile sections of the four-lane highway will be awarded early in November. The highway will follow the South Penn railroad right-of-way which was abandoned in 1889 before completion. Nine tunnels were bored through the mountains and much of the roadbed was leveled which will permit the new highway to be constructed without sharp curves and steep grades.

STATE HIGHWAY DEPARTMENTS expended $551,979,000 for highway construction and $227,877,000 for highway maintenance in 1937, according to reports to the U. S. Bureau of Public Roads. Construction expenditure was $55,000,000 below the 1936 figure.

NATIONAL LIME AND STONE CO., Findlay, Ohio, new owner of the Marion Sand and Gravel Co. plant at Marion, Ohio, has reconditioned the plant and it is again in active production.

Prices Bid—Contracts Let

SAVANNA, ILL.: E. W. Gallagher & Son, Madison, Wis., has been awarded the contract for graveling approximately 10 miles of roadway in Thompson township, Jo Daviess county, at a bid of 87c cu. yd. The estimated amount of gravel for the project is 9265 cu. yd.

PORTSMOUTH, OHIO: Portsmouth Cement & Lime Co. and Horr Bros. have been awarded contracts to furnish 200 bbl. of cement each to the city of Portsmouth for local projects on bids of $2.17.

GREENFIELD, IND.: The bid of Elmer E. Wilson, Route 1, Wilkinson, Ind. of 55c a cu. yd. for pit-run gravel was accepted as was that of Thomas J. Kelly, McCordsville, Ind., of 30c a cu. yd. for gravel from the old Boucher pit 1½ miles over the line in Hamilton county.

EMINGTON, ILL.: Pontiac Stone Co., Pontiac, Ill., has been awarded the contract for spreading 15,048 cu. yd. of crushed stone on the highways of Amity township at a bid of $1.23 per cu. yd.

NEWBURGH, N. Y.: Bids to supply crushed stone for WPA street projects in Newburgh, N. Y. increased 15c per cu. yd. over those made last year. A. E. Lucas, Newburgh, N. Y., low bidder last year was again low with an offer of $2.90 for the two heavier grades and dust, and $3 for the light, stipulating 10c per cu. yd. discount for cash in 15 days. Graney Building Material Corp., Sparkill, N. Y., offered $3.25 for all grades, and Suffern Stone Co., $3.25 per cu. yd. for the higher and $3 flat for dust.

JACKSON, TENN.: Memphis Stone & Gravel Co., Memphis, Tenn., was awarded the contract to furnish the Madison county highway department with 10,000 tons of gravel at $1.16 per ton, which includes freight costs of 66c per ton. Four bidders submitted offers.

ELYRIA, OHIO: Six bids were received on materials for the paving of Broadway in Lorain, Ohio. Among these, low bidders were Granite Concrete Block & Coal Co., Elyria, offering 2050 tons of cement at $1.77 a ton; People's Coal & Buildings Supply Co. and Braun Builders' Supply Co., both of Lorain and both low with $1.35 per ton on 2900 tons of sand. Identical bids on slag were placed at 95c per ton.

KANSAS CITY, KAN.: American Sand Co., Turner, Kan., has been awarded a contract to supply 11,700 cu. yd. of sand for the Marshall creek dam and Wyandotte county recreational park project with a bid of $1.18 per cu. yd. The county commissioners also received eight identical bids from local material dealers to supply 23,500 bbl. of cement at $2.34 per bbl., less 10 per cent for cash.

OKLAHOMA CITY, OKLA.: When Southern Rock Asphalt Co., Oklahoma City, was the only bidder on blended rock asphalt, bidding $5.25 a ton, the same price offered last year, county commissioners ordered new bids on materials. With the firm holding a virtual monopoly on rock asphalt, a district court suit had been filed to enjoin the letting. Gravel bids were received from Southern Rock Asphalt Co. at $1.47 a ton; Midwest Material Co., $1.37 and J. W. Maney, 90c to the county line and 5c a mile for additional hauling.

JEFFERSON, OHIO: Contract has been awarded to Troyer Contracting Co., Aurora, Ohio for 5000 cu. yd. of gravel at 55.4c per cu. yd. on 2½ miles of Graham road, east of Rt. 7, Pierpont, Ohio.

Shingle Surface Manufacturer to Build Crushing Plant

THE STASO MILLING CO., subsidiary of the Central Commercial Co., Somerville, N. J., manufacturers of minerals for surfacing shingles, will construct a large rock crushing plant in Bridgewater Township. It is reported that the plant will be located next to the spur railroad tracks at the Chimney Rock crossing of Route 29 on property purchased from the North Jersey Quarry Co., of which the Bound Brook Crushed Stone Co., is a subsidiary. The project, which embraces nine buildings of steel and concrete, will represent a large investment.

Ready-Mix

ELI Z. ZINN, York, Penn., producer of crushed stone and concrete masonry units, is now in the ready-mixed concrete business. A batching plant has been built and deliveries are being made in four 2½-cu. yd. Jaeger truck mixers. The mixers are mounted on Ford V-8 trucks equipped with Thornton 4-wheel drives.

HARRY T. CAMPBELL SONS CO., Towson, Md., has expanded its ready-mixed concrete facilities to six Blaw-Knox and Jaeger truck mixers of various capacities. The concrete is being batched at the stone plant at Texas, Md., and also from the sand and gravel plant at Cowenden, Md.

KIMBLE SAND & GRAVEL SERVICE, Hamilton, Ohio, operating near Seven Mile Pipe, is rebuilding its plant, using steel construction. A new vibrating screen is being installed. When completed, the new plant will have a capacity of 300 tons daily. C. A. Kimble and C. E. Kimble are partners in the enterprise.

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Federal Wage—Hour Law

Interpreted and Explained

By V. P. AHEARN

Executive Secretary, National Sand & Gravel Association

In his Executive Letters to members of the National Sand and Gravel Association, National Ready Mixed Concrete Association and National Industrial Sand Association, V. P. Ahearn has made a very intelligent analysis of the new wage and hour law. By quoting extracts from these letters, with his permission, the following article is possible:

"The federal wage and hour law is admittedly ambiguous in almost every section of the statute. Congress did not do more than sketch the outlines of a public policy, and it left to the administrator the task of applying the statute to the many industries which will be covered by its provisions. The courts have always viewed administrative orders and definitions as carrying the presumption of regularity.

"As to certain portions of the law, the administrator is instructed to issue official clarifications under the form of rules and regulations. As to other portions, even where clarification is obviously needed, the administrator is not instructed to make interpretations. We and others have insisted that even where the statute is silent as to the authority to issue interpretations, the administrator has the implied obligation to state his position on all parts of the statute irrespective of the question of specific delegation of power to make interpretations.

General Summary

"On and after October 24, 1938, all employes covered by the law must be paid not less than 25c an hour and worked not more than 44 hours a week unless for the time in excess of 44 hours, time-and-one-half of the regular wage is paid. Child labor is prohibited, child labor being defined to include any employe under the age of 16 years. Employment between the ages of 16 and 18 is forbidden whenever the chief of the Children's Bureau of the Department of Labor shall find that the employment is particularly hazardous to children less than 18 years of age. A parent or person standing in place of a parent may employ his own child in an occupation other than manufacturing or mining even if the child is under the age of 16 years. The chief of the Children's Bureau is instructed to provide by regulation for the employment of employes between the ages of 14 and 16 years in occupations other than manufacturing and mining if such employment is confined to periods which will not interfere with schooling and to conditions which will not interfere with health and well being.

Wages and Hours Requirements

"The term 'wage' is defined to include the reasonable cost to the employer of furnishing an employe with board, lodging, or other facilities, if these are customarily furnished by the employer to the employe. The administrator will define 'reasonable cost' by regulation later to be issued.

"No employe subject to the law may be employed for longer than 44 hours a week during the first year, 42 hours a week during the second year and 40 hours a week thereafter. There is no daily limitation and employes may be worked in excess of the prescribed maximum if they receive time-and-one-half for overtime.

"Certain exceptions are made as to the maximum hour stipulations. One exempts employes where they are the subject of a contract between bona fide labor unions and the employer under which the employer undertakes to guarantee employment for six months or one year, and the second applies to seasonal industries. The National Sand and Gravel Association has informed the administrator that its industry appears to have the necessary qualifications for exemption under the seasonal provision, and we have asked him to advise us what data he will require before making an official determination. Until that determination is made, our industry may not take advantage of the seasonal exemption. If it is granted, our employes may be employed in excess of 44 hours per week without the payment of overtime for a period or periods of not more than 14 work weeks in the aggregate in any calendar year, but even here, an employe in a seasonal industry may not be employed in excess of 12 hours in any work-day or in excess of 56 hours in any work-week, as the case may be, without the payment of overtime rates of time and one-half.

Industry Committees

"At the recent meeting of the executive committee of the association it was decided to defer any presentation to the administrator on behalf of the sand and gravel industry with reference to industry committees. It is known that the administrator, so far as industry committees are concerned, is concentrating initially on those industries employing relatively large amounts of labor. It is known also that he feels himself handicapped by lack of funds.

"It was these two circumstances, coupled with the fact that industry committees appear to have only a limited function under the law, that persuaded the executive committee to adopt the position referred to above. Industry committees have nothing to do with maximum hour provisions, which are far more important to our industry than the minimum wages. Their function is confined to making recommendations for advancing the effective date of the statutory minimum wage, and to recommending classifications of employment within the industry either for the purpose of advancing the effectiveness of the statutory minimum wage or to defer the statutory minimums in any case where permitting the minimum wage to go into effect would 'seriously curtail employment.'

Specific Exemptions

"Rules and regulations issued by the administrator on October 19 define the exemption of employes employed in a bona fide executive, administrative, professional, or local retailing capacity, or in the capacity of outside salesmen. It is recommended that they be studied carefully.

"While 'any employe employed as a seaman' is exempt from the wage and hour provision of the law, the administrator was not definitely instructed to issue any clarifying regulations. In the light of this circumstance, the association prepared a letter to Mr. Andrews dated October 3, 1938, which undertook to review other statutes referring to the employment of seamen and to notable court decisions in which definition of the word was involved. We also explained to the administrator our use of the navigable waters of the United States and informed him that as to certain types of employes, we were recommending to our member companies that they be considered as being exempted from the law. Until such time as the administrator issues an official regulation or states his position with

reference to the exemption of seamen through the medium of an interpretative bulletin, we renew our recommendation to the member companies on October 6 that they be guided by the position assumed by the association. We have received an acknowledgement of our letter from the administrator and we shall make available immediately to all member companies any statement which we receive from him later which either agrees with our analysis of the law or disagrees with it.

Those Affected by Law

"The act states that it applies to employes engaged in commerce or in the production of goods for commerce. Thus it is the nature of the employment which brings the law into operation. Only those employes who are engaged in interstate commerce or in the production of goods for interstate commerce are covered by the statute, and the words 'interstate commerce' have been defined by the administrator as not applying to plants whose employes work on raw materials derived from within the state and where none of the products of the plant move in interstate commerce, even where such products come into competition to common markets with similar products which have been produced elsewhere and have been moved in interstate commerce. There must be a movement of goods across state lines before the law becomes operative.

"Where a plant is engaged in producing goods for interstate commerce, all employes of the plant are subject to the law. The Government makes a bona fide case in this regard when it shows that any employe was on the payroll of the company, although that prima facie case may be rebutted by affirmative evidence that the employe not brought under the law was actually not engaged in interstate commerce within the meaning of the law or was exempted by the provisions of Section 13. In his Interpretative Bulletin, Mr. Andrews said that where a given plant is engaged in producing goods for interstate commerce, the act applies to maintenance workers, watchmen, clerks, stenographers, messengers, etc.

"In his Interpretative Bulletin, Mr. Andrews used the expression 'raw materials derived from within the state' in saying that where a company used these and did not ship beyond state lines, the Act did not apply. This immediately raises the question as to whether a company which sells exclusively in intrastate commerce but draws its raw materials from across state lines, is subject to the law. Until the administrator states his position on this phase of the administration of the law, it is our recommendation to member companies that the drawing of raw materials across state lines not be considered as bringing a company under the law which sells exclusively in intrastate commerce. We are asking the administrator to state his position on this question.

"The question has been presented by several member companies as to whether it is possible under the law to divide the time of employes in determining whether they are engaged in commerce or in the production of goods for commerce. In other words, is the employe subject to the law only when he is engaged in an interstate commerce activity. In his Interpretative Bulletin, Mr. Andrews stated that it was the nature of the employment of the particular employe which determined his status as to coverage of the law. Therefore, it seems clear that the employe is not subject to the law when he is not engaged in producing goods for interstate commerce and that his intrastate commerce activities are not embraced by the statute.

"It should be noted, however, that the burden of proof will be upon the employer to show wherever an employe is made subject to the law at certain times and not subject to it at others, that he was actually not engaged at the given time in the production of goods for interstate commerce. The Government has made a prima facie case when it shows that the employe was on the payroll of a company engaged in interstate commerce and that therefore all of his time as an employe is subject to the law. It is going to be difficult if not impossible, under this prima facie procedure, for the employer to divide the time of an employe as between interstate and intrastate commerce in the same payroll period. Obviously the division, if one can be successfully made, will have to be based at least upon different payroll periods.

Employment Records

"The administrator is instructed by the statute to issue rules and regulations covering the maintenance of records. Until those rules and regulations are available, no particular records of employment need be kept by the employer. It is clear from the above, however, that every employer must keep complete employment records, particularly if some of his employes are held by him to be subject to the law, while others are not, and if there is a division of time as to employes who are only partially engaged throughout the year in the production of goods for interstate commerce.

"In the interest of harmony, it seems wise for the employer to explain care-

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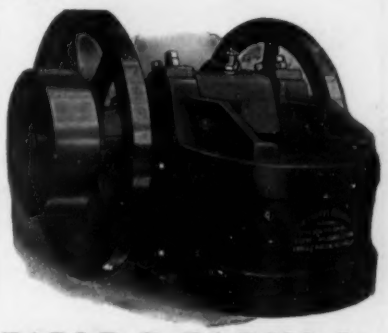

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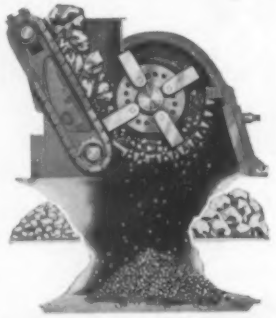

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fully to his employes the nature of any decision which he may reach as to the application of the law to his operations. The need for this policy is emphasized in the case of an industry like our own which, in most sections of the country, does not operate for twelve months and which has made an effort during the operating season to give regular employes the maximum amount of employment to tide them over the idle months. Employes should have first-hand information from the employer as to the policy which he has adopted with reference to the statute.

Enforcement

"The law is a criminal and civil statute. The administrator is authorized to proceed for injunctions against violation of the statute, and any person who willfully violates any of its provisions is subject to a fine of not more than $10,000, or to imprisonment for not more than six months, or both. The imprisonment penalty may not be assessed for a first offense.

"In addition to this, employes or their agents may institute a civil action in cases of failure to receive the minimum wages provided for in the law or for unpaid overtime compensation. They may receive an equal amount as liquidated damages, and the defendant may be required to pay court costs and the attorney fees of the complainant. This section of the statute may produce a flood of claims, since the law obviously has many twilight zones and no one, not even the administrator himself, knows exactly the right answer to every question. This circumstance makes it doubly important that there be frank consultation between the employer and his employes, because employes will not lend themselves so readily to civil damage proceedings if they are acquainted with all of the considerations which have guided the employer.

"In addition to those provisions dealing with the payment of minimum wages and the observance of the maximum hour stipulations, other acts are prohibited under the statute. One may not transport, offer for transportation, ship, deliver, or sell in commerce, or ship, deliver, or sell with knowledge that shipment or delivery or sale thereof in commerce is intended, any goods in the production of which any employe was employed in violation of the law; it is a violation of the law to discharge or in any other manner discriminate

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Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of March 3, 1933.

Of Rock Products, published monthly at Chicago, Illinois, for October 1, 1938.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared Geo. C. Williams, who, having been duly sworn according to law, deposes and says that he is the business manager of the Rock Products and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher — Tradepress Publishing Corporation, 205 W. Wacker Drive, Chicago, Ill.

Editor—Nathan C. Rockwood, 205 W. Wacker Drive, Chicago, Ill.

Managing Editor—Ralph S. Torgerson, 205 W. Wacker Drive, Chicago, Ill.

Business Manager—George C. Williams, 205 W. Wacker Drive, Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Tradepress Publishing Corporation, 205 W. Wacker Drive, Chicago, Ill.

Nathan C. Rockwood, 219 N. Columbia St., Naperville, Ill.

Julius L. Frazier, 2043 Orrington Ave., Evanston, Ill.

MacLean Publishing Company, 481 University Ave., Toronto, 2, Canada.

Col. J. B. Maclean, 7 Austin Terrace, Toronto, Canada.

Horace T. Hunter, 120 Inglewood Drive, Toronto, Canada.

Herbert V. Tyrrell, 221 Dunvegan Road, Toronto, Canada.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is: (This information is required from daily publications only.)

GEO. C. WILLIAMS,
Business Manager.

Sworn to and subscribed before me this 23rd day of September, 1938.

(Seal) FLORENCE L. PRINCE.

(My commission expires May 14, 1940.)

against any employe because such employe has signed any complaint or instituted or caused to be instituted any proceeding under or related to the act, or has testified or is about to testify in any such proceeding, or has served or is about to serve on an industry committee; and it is a further violation not to maintain the employment records required by the administrator or to make any statement or report to the administrator which is known to be false in a material respect."

Sand-Lime Brick Production and Shipment

Eight active sand-lime brick plants reporting for September and nine for August, statistics for which were published in October.

Average price for September

	Plant Price	Delivered Price
Detroit, Mich.	....	$16.00
Grand Rapids, Mich.	$11.00	14.00
Milwaukee, Wis.	10.00	12.50
Pontiac, Mich.	12.50	14.00
Mishawaka, Ind.	10.00	....
Saginaw, Mich.	10.50	13.25
Syracuse, N. Y.	14.00	16.00 C/L 20.00 L/C

Statistics for August and September

	August†	September‡
Production	3,119,700	1,329,125
Shipment (rail)	777,985	288,453
Shipment (truck)	3,130,453	1,565,517
Stock on hand	1,701,390	1,488,400
Unfilled orders	250,000	582,000

† Nine plants reporting: incomplete, eight not reporting unfilled orders and three not reporting stock on hand.

‡ Eight plants reporting: incomplete, one not reporting production, five not reporting unfilled orders and four not reporting stock on hand.

Quarry Site Selected for Grand River Dam

THE GRAND RIVER DAM AUTHORITY has designated the Copeland quarry as the site from which the aggregate will be quarried for construction of the dam near Vinita, Okla. The land from which 500,000 tons of rock will be obtained, is known as the Whitebird lease, and is located east of Bernice and south of Copeland. It is in the reservoir area to be inundated.

New Gravel Firm

CASCADE SAND & GRAVEL CO., Lake City, Wash., is the name of a new company which has started operations with a plant at Kenmore, Wash. Those financially interested in the company are reported to be Z. S. Stone, J. S. Johnson, and Walter Rasmussen. Miss Knapp has been employed as office manager.

Portland Cement Statistics

IN SEPTEMBER, 1938 the portland cement industry produced 10,562,000 bbl., shipped 11,716,000 bbl. from the mills, and had in stock at the end of the month 21,322,000 bbl., according to the Bureau of Mines. Production and shipments of portland cement in September, 1938, showed decreases of 5.9 and 8.3 percent, respectively, as compared with September, 1937. Portland cement stocks at mills were 0.3 percent lower than a year ago.

Total production for the nine months ending September 30, 1938, amount to 75,744,000 bbl., compared with 88,809,000 bbl. in the same period of 1937, and the total shipments for the nine months ending September 30, 1938, amounts to 79,288,000 bbl., compared with 89,839,000 bbl. in the same period of 1937.

Statistics here given are compiled from reports for September received by the Bureau of Mines from all manufacturing plants except one for which estimates have been included in lieu of actual returns.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	September 1937	August 1938	July 1938	June 1938
The Month	53.1	49.9	50.4	50.2	48.8
Twelve Months Ended	47.1	40.2	40.4	40.8	41.0

Concrete Pavement Yardage

Awards of concrete pavement for September, 1938, have been announced by the Portland Cement Association as follows:

Type of construction	Sq. yds. awarded during Sept., 1938	Total sq. yds. during first nine months, 1938
Roads	3,213,274	29,263,729
Streets	1,775,031	11,827,283
Alleys	76,170	602,073
Total	5,064,475	41,693,085

HILLTOP BUILDERS SUPPLIES CO., Cheviot, Ohio is planning to build a new sand and gravel plant of 1200 tons daily capacity this fall and winter.

STURTEVANT

AIR SEPARATORS

242 STURTEVANTS sold on approval for Cement. Not one rejected.

"HIGH EARLY" and regular cement 1500-3300 S.S. Area.

Engineered Installations for raw or clinker show 25 to 100% capacity increase.

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HARRISON SQUARE

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You are cordially invited to attend

The

Twenty-third Annual Convention and Exposition
NATIONAL SAND AND GRAVEL ASSOCIATION

Ninth Annual Convention and Exposition
NATIONAL READY MIXED CONCRETE ASSOCIATION

Netherland Plaza Hotel
Cincinnati, Ohio

January 25, 26 and 27, 1939

The program will be a practical one devoted to the practical problems of the two industries. All who are interested in sand and gravel and ready mixed concrete are cordially invited to be present.

NATIONAL SAND AND GRAVEL ASSOCIATION
NATIONAL READY MIXED CONCRETE ASSOCIATION

Munsey Building ● Washington, D. C.

Traffic and Transportation

PROPOSED RATE CHANGES—*The following are the latest proposed changes in freight rates up to and including the week of October 15:*

Central

55692. Establish on **lime**, common, hydrated, quick or slaked; also **agricultural or fluxing lime**, straight or mixed C.L., min. wt. 50,000 lb., Milltown, Ind., to Paducah, Ky., 14c, via Sou. Ry., Evansville, Ind., and I. C. R. R., Paducah, Ky., such rate to alternate with present rate of 18c, min. wt. 30,000 lb.

55708 (2). Establish on (a) **sand**, naturally bonded moulding, in all kinds of equipment, C. L.; **sand** (except naturally bonded moulding; ground or pulverized sand), in closed equipment, C. L.; (b) **sand**, ground or pulverized, in all kinds of equipment, C. L.; (c) **sand** (except naturally bonded moulding; ground or pulverized sand), in open top equipment, C. L.; to Bristol, Va.-Tenn.: (a) 297c, (b) 327c and (c) 297c per net ton.

55733. Establish on **sand** (except naturally bonded moulding; ground or pulverized sand), in open top equipment, C. L., Essex, Ill., to Benton Harbor, Mich., 138c per net ton, via Wab. Ry., Chicago or Steele, Ill., M. C. R. R.; via Wab. Ry., Chicago, Ill., P. M. Ry.; via Wab. Ry., Tolleston (Gary), Ind., C. S. S. & S. B.

55735. Establish on **limestone**, ground or pulverized, unburnt, C. L., min. wt. 60,000 lb., Northwestern Ohio Group 1 origins to St. Paul and Minneapolis, Minn., 402c per net ton.

55715. Establish on **sand**, lake or beach, C. L., Calumet, Crocker, Gary and Willow Creek, Ind., to Brampton, 370c; Fergus, 452c; Galt, 326c; Georgetown, 370c; Guelph, Guelph Jct., 326c; London, 298c; Ojibway, 216c; St. Catherines, 326c; St. Thomas, 298c; Sandwich, 216c; Sarnia, 298c; Stratford, 326c; Streetsville, Toronto, 370c; Walerville, 216c; Wallaceburg, 298c, and Windsor, Ont., 216c per net ton.

55769. Establish on **core sand**, C. L., Watrousville, Mich., to various pts. in C. F. A. territory, rates the same as currently in effect from Vassar, Mich.

55775. Establish on **slag**, crushed, or crushed commercial (not granulated), in open top cars, C. L., Jackson, Ohio, to Wabash, Ind., 182c per net ton, via B. & O. R. R., Cincinnati, Ohio, C. C. C. & St. L. Ry., or via B. & O. R. R., Defiance, Ohio, Wab. Ry.

55790. Cancel Items 11020-A and 11030-A, C. F. A. L. Tarf. 218-K, publishing rates on **sand**, C. L., Hadley, Penn., to Clarendon, Roystone, Saybrook, Sheffield and Stoneham, Penn., Ashtabula and Ashtabula Harbor, Ohio, to Arcadia, Cherry Tree, Clearfield, Clymer, Curwensville, Dubois, Hellwood, Idamar, Irvona, Mahaffey, Patton, Phillipsburg, Punxsutawney and Wilgus, Penn. Classn. basis to apply.

55838. Establish on **crushed stone and crushed stone screenings**, C. L., Delphos, Ohio, to Ft. Wayne, Ind., 55c per net ton, via N. Y. C. & St. L. R. R. direct.

55922. Establish on **agricultural limestone**, unburned, in open-top cars, C. L., Marblehead, Ohio, to Smithfield, Ohio, 149c per net ton.

55923. Establish on **brucite and dolomite** combined (calcined or dead burned), C. L., min. wt. 60,000 lb., Nario, Mable Grove and Bettsville, Ohio, to Birdsboro, 25c; Bethlehem, Penn., Baltimore, Md., 27c; Coatsville, Penn., 25c; Chester, Conshohocken, Penn., Claymont, Del., Eddystone, Penn., 27c; Harrisburg, Penn., 24c; Harrison, N. J., 28c; Johnstown, Penn., 20c, Lebanon, Penn., 25c; Nicetown, Penn., New Castle, Del., 27c; Newport News, Norfolk, Va., 30c; Pottsville, Penn., 25c; Pencoyd, Penn., 27c; Reading, Penn., Roanoke, Va., 25c; Roebling, N. J., 27c; Syracuse, N. Y., 22c; Steelton, Penn., 24c; Tacony, Penn., 27c; Schenectady, N. Y., 26c; Phoenixville, Penn., Sparrows Point, Md., 27c; Watervliet, N. Y., 26c; Washington, D. C., 27c; Ansonia, Bridgeport, Conn., 28c; Everett, Mass., Phillipsdale, R. I., and Worcester, Mass., 29c.

55928. To establish on **limestone**, ground or pulverized, min. wt. 60,000 lb., West Apolla, Penn., to New Florence, Derry, 99c; Latrobe, 110c; New Alexandria, 116c; Greensburg, 110c; Irwin, 99c; Murraysville, 94c; Export, 88c; Pitcairn, Wilmerding, Turtle Creek, Wilkinsburg, Pittsburgh, 99c; East Greensburg, 110c; Mt. Pleasant, Scottdale, 127c; Connellsville, 132c; Uniontown, 143c; Homestead, McKeesport, 110c; West Elizabeth, Monongahela, 116c; Donora, Charleroi, 127c; California, 132c; Brownsville, 143c; Blairsville, 94c; Homer City, 99c; Freeport, 77c; Cabot, 88c; Butler, 99c; Tarentum, 33c; Springdale, 88c; Oakmont, 94c; New Kensington, 88c; Lettsdale, 116c; Carnegie, 110c; Bridgeville, 116c; Canonsburg, 127c; Washington, 132c; Oakdale, McDonald, 116c; Burgetstown, Penn., 127c net ton.

55930. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass) and **gravel**, in open top cars, LaFayette, Ind., to Rankin, Ill., 44c net ton.

55934. To establish on **dolomite**, roasted (refractory dolomite, in granular form, treated or untreated, clinkered or burned to a dead state), Durbin, O., to Springfield, O., 100c net ton.

55938. To establish on **limestone**, ground or pulverized, unburnt, min. wt. 60,000 lb., Ridgeville, Ind., to Benton Harbor, Mich., 193c net ton.

55950. To cancel rates on **crushed stone, slag or gravel**, coated with oil, tar or asphaltum, Toledo, O., to points in C. F. A. territory. Classn. basis to apply.

55955. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass grinding or polishing, loam, moulding or silica), C. L., Attica, Ind., to Decatur, Ill., 63c, to expire Dec. 31, 1938.

55993. To establish on **crushed stone**, C. L., Huntington, Ind., to Napoleon, O., 70c net ton.

Trunk

37074. **Stone chips or granules** (roofing granules), C. L., min. wt. 50,000 lb., to Portneuf, Que., from Bangor and Pen Argyl, Penn., 31c per 100 lb., in lieu of present 6th class rate.

Sup. 1 to 37074. **Stone** chips or granules (roofing granules), C. L., min. wt. 50,000 lb., from Texas and Cockeysville, Md., to Portneuf, Que., 34c per 100 lb., in lieu of present 6th class rates.

37091. **Sand** (other than ground or pulverized or naturally bonded moulding), and gravel, in open top cars, without tarpaulin or other protective covering, C. L. (See Note 3), from Hopatcong Jct., N. J., to Overbrook and Ardmore, Penn., $1.54 per net ton, in lieu of present sixth class rate 18c per 100 lb. Reason—Based on joint Lycoming scale (increased).

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Southern

17294-1. **Lime**, C. L. Establish 720c, min. 30,000 lb., and 580c net ton, C. L., min. 50,000 lb., Knoxville, River Front Extension and South Knoxville Extension, Tenn., to Kansas City, Mo.

17603. **Crushed stone**, C. L. Establish 176c net ton, Haile, Fa., to Lakeland, Ga.

17633. **Mica**, dry ground, C. L., min. 20,000 lb. Establish from Johnson City, Tenn., to Washington, D. C., 57c; Baltimore, Md., 61c; Philadelphia, Penn., 67c, and New York, N. Y., 74c cwt. Truck competitive.

17705. **Crushed stone**, C. L. Establish from Buchanan, Va., to Riddle, Va., Blanche and Pelhan, N. C., 138c; Milton, Semora, Cunningham, N. C., and Alton, Va., 149c net ton.

17726. **Crushed stone**, C. L. Establish 60c net ton, Rockton, N. C., to Seaforth, N. C. (intrastate).

17735. **Lime**, C. L., min. 30,000 lb. Establish 1066c net ton, Reddick, Fla., to Carteret, N. J.

17748. **Soapstock, stone, graphite.** Cancel, as obsolete, various rates published in Sou. Ry. Alabama Local Tariff I. C. C. A-10171. Class or combination rates to apply.

Western

E-41-259. **Sand** (except naturally bonded molding; ground or pulverized sand), in open top equipment (See Note 2), except when car is loaded to full capacity, actual weight will apply, but orders will not be taken for open top cars of less marked capacity than 80,000 lb., from Essex, Ill. Rates to: Newton, Ia.: Present—16c per 100 lb. Proposed—$2.53 net ton; Fairfield, Ia.: Present—14c per 100 lb. Proposed—$2.20 net ton; Waterloo, Ia.: Present—13c per 100 lb. Proposed—$2.42 net ton; Charles City, Ia.: Present—13c per 100 lb. Proposed—$2.42 net ton.

E-41-260. **Stone**, crushed, (See Note 2), but not less than 50,000 lb., from Morton, Minn., to Waterloo, Ia. Rates: Present—$3 per ton of 2000 lb. Proposed—$1.90 per ton of 2000 lb.

E-41-261. **Stone, crushed,** (See Note 2), but not less than 50,000 lb., from Morton, Minn. to Emmetsburg, Ia. Rates: Present—280c per ton of 2000 lb. Proposed—170c per ton of 2000 lb.

E-41-262. **Stone**, crushed, C. L., min. wt. per Item 4, C&NW Tariff No. 11010-L, from Spencer, S. D., to Des Moines, Ia. Rates, present, 209c per ton of 2000 lb. Proposed, 190c per ton of 2000 lb.

E-41-265. **Sand**, silica, C. L., min. wt. per Item 3625-A, Sup. 55, WTL Tariff 50-P, I. C. C. 2723, from Ottawa, Utica and Wedron, Ill., to Waterloo, Ia. Rates, present, $2.42 per ton of 2000 lb. Proposed, 12c per 100 lb.

E-41-266. **Stone**, crushed, C. L., min. wt. as shown in Item 2420 series of W. T. L. Tariff 6-T, from Lohrville and Red Granite, Wis., to Sandwich, Ill. Rates: Present—12c per 100 lb. Proposed—8½c per 100 lb.

New England

45240. **Crushed stone** (trap rock) (See Note 3), from Westfield, Mass., to Becket and Middlefield, Mass. Present—77; Proposed—67 net ton. (To expire Mar. 20, 1939.) Reason: To meet competition of nearby quarry.

THE INDUSTRY

New Incorporations

Harjo Gravel Co., Oklahoma City, Okla.—With a capital stock of $30,000, the term of existence of its charter has been extended 20 years from May 29, 1934. Incorporators are John Connolly, James Connolly, and R. D. Farmer.

Hillsdale Gravel Company of Sweetwater, Texas, has changed its name to Hillsdale Gravel Co., and decreased its capital stock from $30,000 to $27,000.

Washington Brick & Lime Co., S. 151 Washington, Spokane, Wash., has filed application for a charter with a capital stock of $260,000. Incorporators are Charles P. Lund, Neal R. Fosseen and Ernest L. Frank.

Green Mountain Mica Corp., Kings, Vt., has been granted a charter with 200 shares of no par value. John J. McManus, 150 Broadway, N. Y. C., is incorporator.

Vermont Mica & Mineral Corp., Kings, Vt., has been incorporated by John J. McManus, 150 Broadway, N. Y. C., with a capital stock of 200 shares no par value.

United Rock Wool Insulation Co., 21 Wordell St., Fall River, Mass., with a capital stock of $12,500, comprising 500 shares at $25 each and 1,000 common shares no par value, has been granted a charter. Incorporators are Roderick E. Smith, president and treasurer; Fred A. Boardman, clerk, and Robert N. Smith, et al.

Harrison and Gibson Sand Corp., Columbus, S. C., is the name of a company recently organized with a capital stock of $10,000 to operate sand pits and carry on other mining operations. E. W. Gibson is president and secretary and Gaines W. Harrison is vice-president and treasurer.

Midwest Rock Products Corp., Portland, Ind., has had its charter amended, changing and increasing its authorized stock to 100,000 shares preferred of $1 par value and 5,000 shares common no par value. The amendment also provides for changing the address to 4520 Old Mill road, Fort Wayne, and the agent to James R. Fleming.

Cleveland Sand & Gravel Co., Liberty, Texas, has been incorporated with a capital stock of $50,000 by Noble Garvey, T. F. Bryan and R. E. Biggs.

Onyx Products Co., Dyersville, Iowa has been incorporated with a capital stock of $10,000. Frank J. Riha is president; W. A. McVane, vice-president and V. H. Kitrell, secretary and treasurer.

Washington Brick & Lime Co., Spokane, Wash., has recently been incorporated with a capital stock of $260,000 to engage in the brick and lime business. Incorporators are Charles P. Lund, Neal R. Fosseen and Ernest L. Frank.

Manufacturers

L. H. Gilmer Co., Tacony, Philadelphia, Penn., has announced the opening of a new and direct factory branch at 351-363 E. Ohio St., Chicago, Ill. A. B. McFarland, for five years assistant to the sales manager of the company, is in charge.

Chicago Steel Foundry Co. announces that Fred Grotts, formerly vice-president of the Lebanon Steel Foundry Co., has joined its organization as vice-president in charge of heat and corrosion resisting alloys. Mr. Grotts was formerly chief metallurgist for the Caterpillar Tractor Co., Peoria; manager of the steel wheel plant of the American Steel Foundries, St. Louis; and in charge of alloy sales development at the Continental Roll & Steel Foundry Co., Indiana Harbor.

Atlas Imperial Diesel Engine Co., Oakland, Calif., has recently opened a central division sales office in the Builders Exchange, 228 N. LaSalle St., Chicago, according to an announcement by F. H. Kilberry, president. F. H. Dickson, formerly manager of the Diesel division of Fairbanks, Morse Co., will be in charge of sales of the company's regular line of marine, stationary, industrial and oil field diesels and will be assisted by A. H. Braunsdorff and A. A. Bauer.

Stearns Magnetic Mfg. Co., Milwaukee, Wis., has announced that Harvey Nicholson, St. Louis, Mo., a graduate of the Missouri School of Mines and Metallurgy, Rolla, Mo., has been added to the laboratory staff.

Chain Belt Co., Milwaukee, Wis., has announced the election of Fred V. Gardner as acting treasurer to fill the vacancy created by the recent death of C. L. Pfeifer, and the election of John T. Brown, vice-president to the board of directors. G. M. Dyke, assistant treasurer, was re-elected and A. F. Kessler, chief accountant, was elected an assistant treasurer. Mr. Gardner, who has been connected with the company since early in the year in a consulting capacity, was formerly associated with General Electric Co., at Schenectady, as supervisor of budgets, where he received the Coffin Foundation Award given yearly to the employe who performs the most outstanding service for the furtherance of the industry.

Nordberg Manufacturing Co., Milwaukee, Wis., has made Douglass R. Judd its representative in northern California and Nevada. He has long been identified with the sale of machinery to quarries and mines in that section and will devote most of his time to the sales of Symons crushers and screens. His headquarters for the present are 8027 Outlook Ave., Oakland, Calif.

Gar Wood Industries, Inc., Detroit, Mich., will stage an exhibit of its complete line of products manufactured by the hoist and body, road-machinery, winch and tank divisions, at the Fifth Annual National Motor Truck Show, Port of New York Authority Building, New York City, Nov. 11-17, 1938. Miniatures of the hoist and body hydraulic scraper and truck tank will be displayed. The exhibit will occupy space 28, and C. D. Macpherson will be in charge.

Silent Hoist Winch & Crane Co., Brooklyn, N. Y., has moved its works and general offices to new and larger quarters at 841 to 865 63rd St. It was forced to move from its former location to make way for the Red Hook housing project.

Hercules Powder Co., Wilmington, Del., reports that Carl J. H. Anderson, for several years art director in charge of design and printing, is dead. In addition to supervising the company's artwork and printing he was editor of Hercules' "Paper Maker."

Timken Roller Bearing Co., Canton, Ohio, announces the appointment of Yale D. Hills as manager of distributor sales for its service-sales division. For several years he had been manager of the Los Angeles territory branch of the company.

Trade Literature

The following literature, recently published is available free, upon request to the respective sponsor:

Reduction Crushers.—Traylor Engineering & Manufacturing Co., Allentown, Penn. Bulletin No. 2112 describes and illustrates in detail the Traylor Type TY Reduction Crusher.

Batching by Weight.—The Buffalo Scale Co., Buffalo, N. Y. Bulletin 385 describes and illustrates its new line of automatic batching scales which feature electric eye and interlocking sequence controls, as well as manual manipulation of the scale beams.

Boiler Setting.—Plibrico Jointless Firebrick Co., 1800 Kingsbury St., Chicago, Ill., is offering a new, 40-page edition of its catalog which covers the subject of boiler setting construction and refractory linings for horizontal, return, tubular and other types of fire tube boilers. A considerable section is devoted to air-cooling, modernization of existing settings, and principles of furnace design.

Automatic Combustion Control.—Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland, Ohio. A 32-page bulletin, No. 102-B, "Bailey Meter Control" describing the application of the Bailey steam flow-air flow automatic readjustment type of air-operated combustion control has just been published. The bulletin features an explanation of fundamental principles involved in controls, both for boilers fired with stokers and for boilers fired with fuels in suspension.

Graders.—Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has issued a new Speed Patrol catalog entitled "Change By-Ways to Highways." The operation of the various parts of the Speed Patrols is diagramatically illustrated by cutaway drawings and photographs, and there are many action views to illustrate the work done by these machines.

Machine Speed Control.—Reeves Pulley Co., Columbus, Ind., has issued a new 124-page catalog (No. G-348) covering the complete line of Reeves variable speed control equipment in one compact, easy to use volume.

Portable Crushers.—Iowa Manufacturing Co., Cedar Rapids, Iowa. Bulletin No. RC-2 describes the latest type and models of Cedar Rapids tractor-crusher units. Actual job illustrations portray the flexibility of these crushers.

Air Ventilation and Air Compression.—B. F. Sturtevant Co., Hyde Park, Boston, Mass. A number of new bulletins describe and illustrate the application and function of its planing mill exhausters (catalog No. 430), industrial vacuum cleaning systems (No. 368-2), centrifugal compressors (No. 386), electric fans and blowers (No. 400-6), monogram fans (No. 337), Rexvane heaters (No. 395-3), dust collecting—material handling—fume removal equipment (No. 428), pneumatic collecting and conveying systems (No. 291-1) and steam turbines (No. 426).

Ball and Roller Bearing Lubrication.—The Texas Co., New York. This is the name of a new booklet that gives useful information on the characteristics and care of bearings and discusses the part that proper lubrication plays in their more efficient use.

Earth Moving Calculator.—R. G. LeTourneau, Inc., Peoria, Ill. A new improved grade and haul calculator for 12 cu. yd. Carryalls—an accurately engineered and carefully prepared slide-rule for easy computation of earth-moving data—is now ready for distribution.

Magnetic Separators.—Dings Magnetic Separator Co., Milwaukee, Wis. A new catalog, No. 22, deals primarily with Dings high intensity lifting magnets, but also illustrates other types of magnetic separators manufactured by this company.

ATTENTION, ALL BELT USERS!

Only* ONE *cord belt has this patented* BALANCED *construction that insures a true-running belt

BALANCED BODY made of heavy rope-cord spiralled continuously without a splice. Cord on opposing sides of belt axis is twisted in opposite directions to neutralize torque of cord.
BALANCED COVER laid parallel to axis of belt — made of fabric in which alternate warp threads are twisted in opposite directions to prevent side-creep.
RIGHT-HAND TWIST
LEFT-HAND TWIST
GOODYEAR COMPASS CORD BELT balanced construction fully covered by U. S. and foreign patents

THE truly sensational success of the Goodyear COMPASS Cord transmission belt in solving industry's most difficult belting problems has led to many imitations seeking to capitalize on the magic word "cord."

But what makes the Goodyear COMPASS the truest-running, most nearly stretchless belt on the market—what gives it such exceptionally high flex-life and long wear—is a fully patented method of cord construction no other belt manufacturer can employ!

The Goodyear COMPASS Cord is a modernized flat belt version of the ancient rope drive. With rope drives, as you know, it is necessary to use grooved pulleys to keep the ropes from running off due to their torque or twisting action.

In the COMPASS this torque is balanced by twisting the ropes, or cords, on opposing sides of the belt axis in opposite directions. Alternate warp threads in the fabric cover are similarly twisted. This patented construction in both body and cover neutralizes any tendency to run off the pulley with an equal pull toward the opposite side, insuring a belt that runs true.

More than this, it permits Goodyear to use larger, stronger cord, eliminating fabric plies entirely in the carcass, and making a thinner, stronger belt with far higher flex-life and longer service-life.

The best proof of this is the remarkable performance of COMPASS belts on industry's hardest drives. From two to five times longer life with practically no stretch is typical. So don't be deceived by the word "cord." The Goodyear COMPASS Cord belt is the only belt in the world with patented balanced cord construction that insures true-running, high flex-life, low stretch and maximum wear. To test COMPASS superiority for yourself, call the nearest Goodyear Mechanical Rubber Goods Distributor.

BELTS
MOLDED GOODS
HOSE
PACKING
Made by the makers of Goodyear Tires

THE GREATEST NAME IN RUBBER

GOODYEAR

Classified Directory of Advertisers

For alphabetical index see p. 94

Aerial Tramways
American Cable Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.

Aggregates (Special)
Mica Crystal Co.

Agitators
Allis-Chalmers Mfg. Co.
Hetherington & Berner, Inc.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Air Compressors
Allis-Chalmers Mfg. Co.
Fuller Co.
Nordberg Mfg. Co.
F. L. Smidth & Co.
B. F. Sturtevant Co.
Traylor Engineering & Mfg. Co.

Air Filters
Blaw-Knox Co.
Fuller Co.

Air Separators
Blaw-Knox Co.
Combustion Engr. Corp.
Link-Belt Co.
Raymond Pulv. Div.
Smidth, F. L., & Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulv. Co.

Airveyors
Fuller Co.

Ash & Refuse Handling Equipt.
Allen-Sherman Hoff Co.
Haiss, Geo., Mfg. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
Robins Conveying Belt Co.

Asphalt Mixer Regulators
Hetherington & Berner, Inc.

Asphalt Mixing Plants
Hetherington & Berner, Inc.
Traylor Engineering & Mfg. Co.

Axles
Eagle Iron Works

Babbitt Metal
Allis-Chalmers Mfg. Co.
Dixie Machy. Mfg. Co.
Ryerson, Jos. T., & Son, Inc.

Backdiggers
Link-Belt Co.

Backfillers
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Link-Belt Co.
Thew Shovel Co.

Bag Cleaning Machines
Link-Belt Co.

Bag Ties
Wickwire-Spencer Steel Co.

Bagging Machines
Smidth, F. L., & Co.

Baiers or Bundling Machines (Sack)
Besser Mfg. Co.

Balls (Grinding)
Allis-Chalmers Mfg. Co
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Barges
Eagle Iron Works

Batchers, Measuring Volume
Besser Mfg. Co.
Fuller Company
Jaeger Machine Co.
Smith, T. L., Co.

Batteries
Goodyear Tire & Rubber Co.

Bearing Metals
Allis-Chalmers Mfg. Co.

Bearings (Anti-Friction)
Eagle Iron Works
Hetherington & Berner, Inc.
Link-Belt Co.
Robins Conveying Belt Co.
Ryerson, Jos. T., & Sons, Inc.
SKF Industries, Inc.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

Bearings (Ball)
SKF Industries, Inc.

Bearings (Roller and Tapered Roller)
SKF Industries, Inc.
Timken Roller Bearing Co.

Bearings (Thrust)
SKF Industries, Inc.
Timken Roller Bearing Co.

Belting (Elevator and Conveyor)
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Goodyear Tire & Rubber Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.

Belting (Transmission)
Bacon, Earle C., Co.
Goodyear Tire & Rubber Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Smidth, F. L., & Co.

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Link-Belt Co.

Belting (Wire)
Wickwire-Spencer Steel Co.

Belt Fasteners or Hooks
Flexible Steel Lacing Co.
Robins Conveying Belt Co.

Belt Idlers
Link Belt Co.
Robins Conveying Belt Co.
Smith Engineering Wks.

Belt Lacing
Bristol Co.
Flexible Steel Lacing Co.

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Robins Conveying Belt Co.

Belt Trippers
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Robins Conveying Belt Co.

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Allen-Sherman-Hoff Co.
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Bacon, Earle C., Co.
Besser Mfg. Co.
Fuller Co.
Geo. Haiss Mfg. Co., Inc.
Hendrick Mfg. Co.
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McLanahan & Stone Corp.
Robins Conveying Belt Co.
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Traylor Engineering & Mfg. Co.

Bin Indicators
Fuller Co.

Bins (Storage)
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Blaw-Knox Co.
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Hendrick Mfg. Co.
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Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Blasting Cap Crimpers
Ensign-Bickford Co.

Blasting Supplies
Ensign-Bickford Co.

Block Machines, Building
Anchor Concrete Machinery Co.
Besser Mfg. Co.
Multiplex Concrete Machy Co.

Blocks (Pillow)
Allis-Chalmers Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
SKF Industries, Inc.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

Blocks (Sheave)
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Sauerman Bros.

Blowers
Allis-Chalmers Mfg. Co.

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Link-Belt Co.
Robins Conveying Belt Co.

Boilers
Combustion Engineering Corp.

Bolts
Standard Pressed Steel Co.

Brick Machines
Besser Mfg. Co.
Multiplex Concrete Mach. Co.

Buckets (Clamshell, Grab, Orange Peel, etc.)
Blaw-Knox Co.
Bucyrus-Erie Co.
Geo. Haiss Mfg. Co., Inc.
Hayward Company
Jaeger Machine Co.
Link-Belt Co.
Robins Conveying Belt Co.

Buckets (Dragline and Slackline)
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Company
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Sauerman Bros., Inc.

Buckets (Dredge & Excavator)
Bucyrus-Erie Co.
Haiss, Geo., Mfg. Co.
Hayward Co.

Buckets (electric heated, weighing)
Easton Car & Const. Co.

Buckets (Elevator and Conveyor)
Bacon, Earle C., Co.
Haiss, Geo., Mfg. Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Lewistown Foundry & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smith Engr. Wks.

Building Tile Machines
Besser Mfg. Co.
Multiplex Concrete Machy. Co

Bulldozers
Blaw-Knox Co.
Bucyrus-Erie Co.
Koehring Co.

Bullscrapers
Bucyrus-Erie Co.

Bushings
Eagle Iron Wks.
Link-Belt Co.

Cableways
American Cable Co. Inc.
Blaw-Knox Co.
Leschen, A., & Sons Rope Co.
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Macwhyte Co.
Sauerman Bros.
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Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Capstans
Link-Belt Co.
Robins Conveying Belt Co.

Cars (Block, Dump, Industrial, Etc.)
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)
Eagle Iron Works
Easton Car & Const. Co.
Link-Belt Co.
Multiplex Concrete Mach. Co.
Traylor Engineering & Mfg. Co.

Car Couplings & Hitches
Macwhyte Co.

Car Dumps
Eagle Iron Wks.
Link-Belt Co.

Car Pullers & Movers
Link-Belt Co.
Robins Conveying Belt Co.

Car Wheels
Eagle Iron Wks.
Link-Belt Co.

Castings
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Blaw-Knox Co.
Dixie Machinery Mfg. Co.
Eagle Iron Works (Grey Iron)
Hetherington & Berner, Inc.
Link-Belt Co
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Timken Roller Bearing Co
Traylor Engineering & Mfg. Co.

Cement
Dewey Portland Cement Co.

Cement Plants (Contractor)
Allis-Chalmers Mfg. Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Cement Colors
Mepham, Geo. S., Corp.

Cement Process
Cement Process Corp.

WHEN YOU FIGURE YOUR LUBRICATION COSTS...

bring COMPARATIVE MAINTENANCE COSTS *into the picture*

then learn the real value of

GULF'S *higher quality* LUBRICANTS!

TRY this measuring stick on your lubrication costs: compare your maintenance costs from month to month and determine whether they are going up or down. If maintenance is high, ineffective lubrication may be the reason . . . and no matter how little you're paying for lubricants, your *real* lubrication costs may be too high!

After making a careful study of comparative maintenance costs, an official of a large operating company recently said: "Of course we are paying a few dollars more each month for Gulf's higher quality lubricants, but look at this reduction in maintenance costs! Our actual dollar savings amount to nearly ten times the total cost of the lubricants. At that rate we're getting our oils and greases for less than nothing . . . *and that's the lowest lubrication cost I ever heard of!*"

You may find it difficult to evaluate all the intangible factors that make up your final lubrication costs. But of this you may be sure: when you put Gulf's higher quality lubricants to work you have taken a forward step toward improving production, reducing waste, cutting maintenance expense and making over-all savings which will give you the lowest possible "lubrication costs."

Ask the Gulf representative who calls at your plant to discuss this matter in detail. He can help you get a true picture of your actual lubrication costs. Gulf Oil Corporation—Gulf Refining Company, Gulf Building, Pittsburgh, Pa.

GULF INDUSTRIAL LUBRICATION

Also MAKERS OF A COMPLETE LINE OF FUEL AND FURNACE OILS

EAGLE WASHER

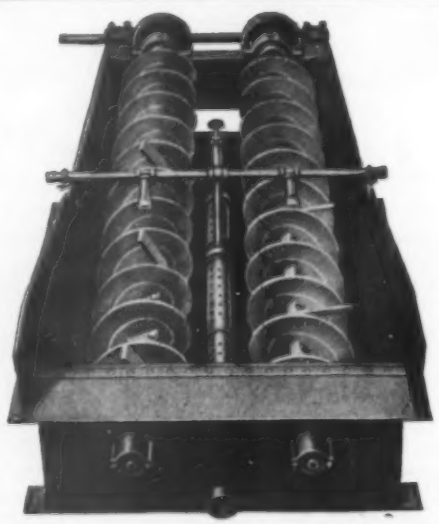
Reduces Shale Content to 0.8%

THE Northwestern Gravel Company installed an EAGLE Twin Screw Washer and Shale Remover which enables them to reduce the shale content of the aggregates, which is relatively high, to 0.8% by weight, which is under the limit allowed by the Iowa State Highway Department.

This is another actual example of how EAGLE WASHERS are enabling producers everywhere to recover material which was formerly wasted and turn deposits considered to be unprofitable into real income producers. They thoroughly wash and scrub the aggregate, eliminating all mud, sticks, leaves, silt, coal, shale and clay balls. They produce a finished product which can meet the most rigid specification requirements.

From our complete line of aggregate washing equipment, both Spiral Screw and Paddle Log, developed to the highest degree of efficiency, you will find the type and size best suited for your needs.

Write for descriptive literature today.



EAGLE IRON WORKS

DES MOINES . . . . . IOWA

Classified Directory (Cont.)

Cement Pumps
Fuller Co.
Smidth, F. L., & Co.

Central Mixing Plants (Concrete)
Blaw-Knox Co.
Jaeger Machine Co.

Chain (Dredge and Steam Shovel)
Bucyrus-Erie Co.
Link-Belt Co.

Chain (Elevating and Conveying)
Bacon, Earle C., Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.

Chimney Block Machines and Molds
Besser Mfg. Co.

Chutes (Bin, Truck, Concrete, Etc.)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earl C. Bacon, Inc.
Blaw-Knox Co.
Eagle Iron Works
Haiss, Geo., Mfg. Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg Co.

Chute Liners
Bacon, Earle C., Inc.
Goodyear Tire & Rubber Co.
Haiss, Geo., Mfg. Co.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smidth, F. L., & Co.

Circuit Breakers
Allis-Chalmers Mfg. Co.

Clarifiers
Link-Belt Co.

Classifiers
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Eagle Iron Works
Lewistown Fdry. & Mach. Co.
Link-Belt Co.
Nordberg Manufacturing Co.
Pioneer Engineering Wks., Inc.
Raymond Pulverizer Division
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.
Universal Vibr. Screen Co.
Williams Patent Crusher & Pulv. Co.

Clutches
Allis-Chalmers Mfg. Co.
Link-Belt Co.

Coal Pulverizing Equipment
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Combustion Engr. Corp.
Link-Belt Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co.
Traylor Engr. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Concrete Mixers
Anchor Concrete Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Jaeger Machine Co.
Koehring Co.
Multiplex Concrete Machy. Co
Smith, T. L., Co.

Controllers (Electric)
Allis-Chalmers Mfg. Co.

Converters (Electric)
Allis-Chalmers Mfg. Co.

Conveyors (Apron)
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Barber-Greene Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engr. & Mfg. Co.
Wickwire-Spencer Steel Co.

Conveyors (Belt)
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earle C. Bacon
Barber-Greene Co.
Besser Mfg. Co.
Fuller Company
Geo. Haiss Mfg. Co., Inc.
Hendrick Mfg. Co.
Lewistown Fdy. & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Multiplex Concrete Mach. Co.
New Holland Machine Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Wickwire-Spencer Steel Co.
Williams Patent Crusher & Pulv. Co.

Conveyors (Hydro Vacuum)
Allen-Sherman Hoff Co.

Conveyors (Pan)
Allis-Chalmers Mfg. Co.
Link-Belt Co.

Conveyors (Pneumatic)
Fuller Company
Raymond Pulverizer Division

Conveyors (Screw)
Besser Mfg. Co.
Eagle Iron Works
Link-Belt Co.

Conveyors (Trolley)
Link-Belt Co.

Conveyors (Vibrating)
Allis-Chalmers Mfg. Co.
Link-Belt Co.
Smidth, F. L., & Co.

Conveyor Idlers & Rolls
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Barber-Greene Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smidth, F. L., & Co.

Coolers
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Link-Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Coolers (Clinker)
Fuller Co.

Correcting Basins
F. L. Smidth & Co.

Couplings (Flexible and Shaft)
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Link-Belt Co.
Robins Conveying Belt Co.
Standard Pressed Steel Co.

Cranes (Diesel Electric Steam, Etc.)
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.
Thew Shovel Co.

Cranes (Tractor)
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.

Classified Directory (Cont.)

Cranes (Truck)
Thew Shovel Co.

Crawler Attachments
Allis-Chalmers Mfg. Co.
Link-Belt Co.

Crawling Tractor Excavators
Austin-Western Road Machy. Co.
Koehring Co.
Link-Belt Co.
Thew Shovel Co.

Crusher Parts
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Bacon, Earle C., Co.
Dixie Machinery Mfg. Co.
Eagle Iron Works
McLanahan & Stone Corp.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Traylor Engr. & Mfg. Co.

Crushers (Hammer)
Allis-Chalmers Mfg. Co.
American Pulv. Co.
Austin-Western Road Machy. Co.
Brooks Equipment & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)
Dixie Machy. Mfg. Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earle C. Bacon, Inc.
Dixie Machinery Mfg. Co.
Lewistown Fdy. & Mach. Co. (Jaw)
McLanahan & Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Laboratory)
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Bacon, Earle C., Co.
Dixie Machinery Mfg. Co.
Pennsylvania Crusher Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Primary Breakers)
Allis-Chalmers Mfg. Co.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Reduction)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.

Crushers (Ring)
American Pulverizer Co.
Dixie Machinery Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Roll)
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Besser Mfg. Co.
Brooks Equipment & Mfg. Co.
Eagle Iron Works
Link-Belt Co.
McLanahan & Stone Corp.
New Holland Machine Co.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushing and Screening Plants (Portable)
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Blaw-Knox Co.
Dixie Machinery Mfg. Co.
Eagle Iron Works
Link-Belt Co.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Curing Racks
Besser Mfg. Co.
Multiplex Concrete Machy. Co.

Dedusters
Blaw-Knox Co.

Dehydrators
Pioneer Engineering Wks., Inc.

Derricks
Hayward Company

Detonators
Ensign-Bickford Co.

Dewatering Machines
Allis-Chalmers Mfg. Co.
Eagle Iron Wks.
Jaeger Machine Co.
Link-Belt Co.
Morris Machine Works

Diaphragms (Rubber)
Jaeger Machine Co.

Dippers & Teeth (Dredge & Shovel
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.
Thew Shovel Co.

Disentegrators
Smidth, F. L., & Co.

Ditchers
Barber-Greene Co.
Bucyrus-Erie Co.

Dragline Cableway Excavators
American Cable Co.
Austin-Western Road Machy. Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.
Sauerman Bros., Inc.
Thew Shovel Co.
Wickwire-Spencer Steel Co.

Dredges
Bucyrus-Erie Co.
Eagle Iron Works
Hayward Co.
Hetherington & Berner, Inc. (Complete Steel)
Link-Belt Co.
Morris Machine Works

Dredge Cutter Heads & Ladders
Eagle Iron Wks.
Hetherington & Berner, Inc.

Dredge Hulls
Eagle Iron Wks.

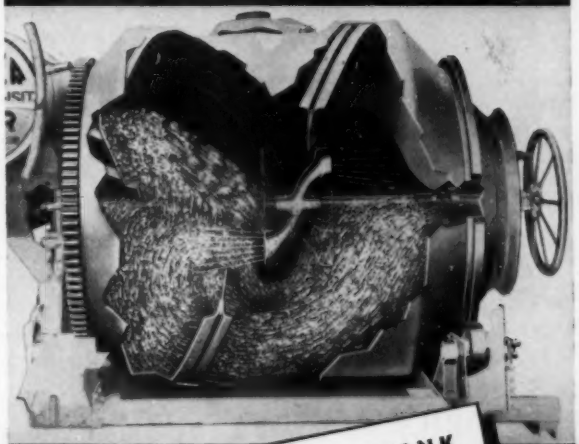
Dredging Sleeves
Hetherington & Berner, Inc.

Drills (Blast Hole)
Bucyrus-Erie Co.

Drills (Rock)
Bucyrus-Erie Co.
Timken Roller Bearing Co.

They're Buying Jaegers because

JAEGER ALONE Builds This MODERN TRUCK MIXER....



1. SYPHO-METER WATER TANK
Accurate within a fractional per cent of tank capacity regardless of tank position or splashing on roughest roads — a 1939 improvement.

2. DUAL REVOLVING WATER SPRAYS
100% faster, uniform water distribution — clear path as they revolve, spray into and over mass in both directions, from end to end of drum — insure thoro mix even on shortest hauls — a 1939 improvement.

3. MORE SALABLE CONCRETE
Jaeger Reversing End-to-End Mix, plus accurate measurement and more rapid and uniform distribution of water, produce recognized higher strength concrete, give Jaeger operators a basic sales advantage. Bulletin TM-39 gives up-to-the-minute information. Send for your copy.

THE JAEGER MACHINE COMPANY
603 Dublin Ave. Columbus, Ohio

Better Screening and Longer Life Mean LOWER COSTS

For vibrating, revolving and shaking screens there is no more efficient medium than perforated plate—with its wide variety of standard perforations and special openings.

Add to the efficiency of perforated plate, the long wearing qualities of Hendrick's special high carbon, heat treated steel and you have a combination that spells efficient screening at lowest cost.

For the full story of Hendrick Perforated Plate, send for a copy of perforated metals handbook.

HENDRICK MANUFACTURING CO.

47 Dundaff St., Carbondale, Pa.

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Minneapolis, Minnesota

PIONEER ROCK GRAVEL EQUIPMENT

Classified Directory (Cont.)

Drills (Well)
Bucyrus-Erie Co.

Drill Bits
Bucyrus-Erie Co.
Timken Roller Bearing Co.

Drill Sharpening Machines
Bucyrus-Erie Co.

Drilling Accessories
Bucyrus-Erie Co.
Timken Roller Bearing Co.

Drives (Belt, Chain and Rope)
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.
Smidth, F. L., & Co.

Drives (Short Center)
Allis-Chalmers Mfg. Co.
Earle C. Bacon, Inc.
Link-Belt Co.
Smidth, F. L., & Co.

Drives (Worm)
Link-Belt Co.

Dryers
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Combustion Engineering Corp.
Hetherington & Berner, Inc.
Lewistown Foundry & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Raymond Pulverizer Division
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.
Tyler, W. S., Co.
Williams Patent Crusher & Pulv. Co.

Dryer (Coolers)
Warren Brothers Road Co.

Dust Collecting Systems
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Raymond Pulverizer Division
Smidth, F. L., & Co.

Dust Conveying Systems
Allen-Sherman-Hoff Co.
Blaw-Knox Co.
Fuller Company

Electric Motors
Allis-Chalmers Mfg. Co.

Electric Motor Starters
Allis-Chalmers Mfg. Co.

Elevators
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Besser Mfg. Co.
Eagle Iron Works
Fuller Company
Haiss, Geo., Mfg. Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Lewistown Foundry & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Multiplex Concrete Mach. Co.
New Holland Machine Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Engineers
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Blaw-Knox Co.
Fuller Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Morris Machine Works
Productive Equipment Corp.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Engines (Diesel, Gasoline, Kerosene and Oil)
Allis-Chalmers Mfg. Co.
New Holland Machine Co.
Nordberg Mfg. Co.

Engines (Natural Gas)
Allis-Chalmers Mfg. Co.

Engines (Steam)
Allis-Chalmers Mfg. Co.
Morris Machine Works
Nordberg Mfg. Co.

Exhauster
Combustion Engineering Co.
Raymond Pulverizer Division

Fans (Exhaust & Ventilating)
Blaw-Knox Co.
Smidth, F. L., & Co.

Feeders
Allis-Chalmers Mfg. Co.
Earle C Bacon, Inc.
Barber-Greene Co.
Besser Mfg. Co.
Blaw-Knox Co.
Fuller Co.
Hetherington & Berner, Inc.
Link-Belt Co.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smidth, F. L., & Co.
Smith Engr. Wks.
Traylor Engineering & Mfg. Co.

Filter Cloth
Tyler, W. S., Co.
Wickwire-Spencer Steel Co.

Flexible Couplings
Lovejoy Flexible Coupling Co.

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Forgings
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.

Fuels (Diesel)
Texas Co.

Fuses (Detonating and Safety)
Ensign-Bickford Co.

Fuse Cutters
Ensign-Bickford Co.

Fuse Lighters
Ensign-Bickford Co.

Gaskets
Goodyear Tire & Rubber Co.

Gasoline
Gulf Refining Co.
Texas Company

Gears
Abart Gear and Machine Co.
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Generators & Motor Generator Sets
Allis-Chalmers Mfg. Co.
Nordberg Mfg. Co.

Glass Sand Equipment
Lewistown Fdry. & Mach. Co.

Grapples
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Co.

Grease
Bacon, Earle C., Co.
Gulf Refining Co.
Texas Company

Grease Cups
Link-Belt Co.
Robins Conveying Belt Co.

Guards (Lamp)
Flexible Steel Lacing Co.

Guards (Machinery)
Harrington & King Perforating Co.
Tyler, W. S., Co.

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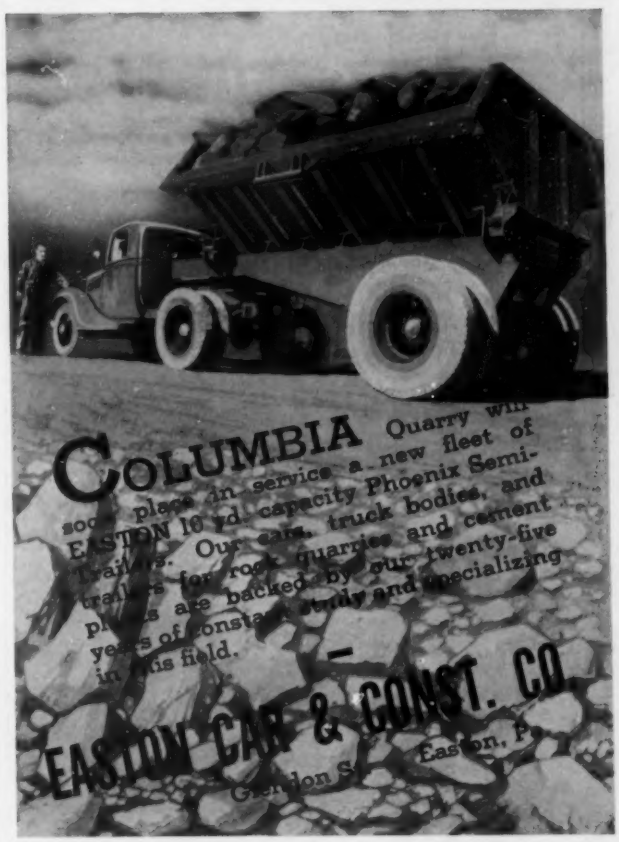

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Classified Directory (Cont.)

Guns (Hydraulic)
Hetherington & Berner, Inc.
Morris Machine Works

Gypsum Plants
Traylor Engr. & Mfg. Co.

Heaters (Bitumen)
Easton Car & Const. Co.

Hoists (Chain, Electric, Portable, Skip, Etc.)
Allis-Chalmers Mfg. Co.
Besser Mfg. Co.
Commercial Shearing & Stamping Co.
Eagle Iron Works
Hetherington & Berner, Inc.
Jaeger Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Nordberg Mfg. Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Sauerman Bros., Inc.
Smith Engr. Wks.
Traylor Engineering & Mfg. Co.

Hoppers
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Hose (Water, Steam, Air Drill, Pneumatic, Sand Suction and Discharge)
Dixie Machinery Mfg. Co.
Goodyear Tire & Rubber Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Morris Machine Works

Hydrators (Lime)
Traylor Engr. & Mfg. Co.

Jigs (Sand and Gravel)
Allis-Chalmers Mfg. Co.
Traylor Engineering & Mfg. Co.

Kilns Parts
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Kilns (Rotary)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Kilns (Vertical)
Blaw-Knox Co.

Kiln Burners
Smidth, F. L., & Co.

Kiln Chain Systems
Smidth, F. L., & Co.

Kiln Liners (Metal)
Traylor Engr. & Mfg. Co.

Kominuters
Smidth, F. L., & Co.

Laboratory Apparatus
Smidth, F. L., & Co.

Lift Trucks
Besser Mfg. Co.

Lime Handling Equipment
Fuller Co.
Link-Belt Co.
Raymond Pulv. Div.
Robins Conveying Belt Co.

Lime Plants
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Loaders (Bin, Car, Hopper, Truck, Etc.)
Barber-Greene Co.
Besser Mfg. Co.
Bucyrus-Erie Co.
Fuller Company
Geo. Haiss Mfg. Co., Inc.
Link-Belt Co.
New Holland Machine Co.
Robins Conveying Belt
Ross Screen & Feeder Co.

Loaders (Boat)
Link-Belt Co.

Loaders (Box Car)
Barber-Greene Co.
Link-Belt Co.

Loaders (Underground)
Allis-Chalmers Mfg. Co.
Nordberg Mfg. Co.
Thew Shovel Co.

Locomotives (Diesel & Diesel-Electric
Fate-Root-Heath Co.
Lima Locomotive Works, Inc. (Locomotive Div.)
Plymouth Locomotive Wks.

Locomotives (Electric, Trolley & Storage Battery)
Lima Locomotive Works, Inc. (Locomotive Div.)

Locomotives (Gasoline & Gas-Electric)
Fate-Root-Heath Co.
Lima Locomotive Works, Inc. (Locomotive Div.)
Plymouth Locomotive Wks.

Locomotive (Kerosene)
Lima Locomotive Works, Inc.

Locomotives (Oil & Oil-Electric)
Fate-Root-Heath Co.
Lima Locomotive Works, Inc. (Locomotive Div.)
Plymouth Locomotive Wks.

Locomotives (Steam)
Lima Locomotive Works, Inc. (Locomotive Div.)

Locomotive Stack Netting
Tyler, W. S., Co.

Lubricants
Bacon, Earle C., Inc.
Gulf Refining Co.
Robins Conveying Belt Co.
Texas Co.

Manganese Steel Parts
Bacon, Earle C., Inc.

Material Handling Equipment
Allen-Sherman-Hoff Co.
Austin-Western Road Machy. Co.
Barber-Greene Co.
Fuller Company
Link-Belt Co.
Raymond Pulverizer Division
Robins Conveying Belt Co.

Measuring Devices
Blaw-Knox Co.
Jaeger Machine Co.

Mechanical Rubber Goods
Goodyear Tire & Rubber Co.

Mill Parts
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Mills, Grinding (Ball, Tube, Hammer, Rod, Roll, Etc.) (See also Pulverizers)
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Brooks Equipment & Mfg. Co.
Dixie Machinery Mfg. Co.
Lewistown Foundry & Mach. Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Mill Liners
Allis-Chalmers Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Mortar Colors
Mepham, Geo. S., Corp.

Mortar Mixers
Eagle Iron Works
Jaeger Machine Co.

Nozzles (Gravel Washing)
Link-Belt Co.

Classified Directory (Cont.)

Nuts
Standard Pressed Steel Co

Oils (Lubricating)
Bacon, Earle C., Inc.
Gulf Refining Co.
Robins Conveying Belt Co.
The Texas Co.

Oils (Cutting)
The Texas Co.

Ornamental Forms (Concrete)
Besser Mfg. Co.

Packing
Crane Packing Co.
Goodyear Tire & Rubber Co.

Pallets
Anchor Concrete Machinery Co.
Bacon, Earle C., Inc.
Besser Mfg. Co.
Commercial Shearing and Stamping Co.
Multiplex Concrete Machy Co.

Pans, Grinding (Wet & Dry)
Eagle Iron Works
Traylor Engineering & Mfg. Co.

Perforated Metal
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Chicago Perforating Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Joseph T. Ryerson & Son, Inc.
Traylor Engr. & Mfg. Co.
Wickwire-Spencer Steel Co.

Perforated Screen Plates & Cloth—See Screen Cloth & Plates

Pinions
Bacon, Earle C., Inc.
Haiss, Geo., Mfg. Co.
Link-Belt Co.

Pipe Molds and Machines (Concrete)
Besser Mfg. Co.

Pipe
Hetherington & Berner, Inc.
Morris Machine Works

Pipe Fittings
Hetherington & Berner, Inc.

Plaster Colors
Mepham, Geo. S., Corp.

Pontoons
Eagle Iron Works
Morris Machine Works

Power Transmission Machinery
Allis-Chalmers Mfg. Co.
Link-Belt Co.
SKF Industries, Inc.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

Pulleys
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.
Robins Conveying Belt Co.

Pulverizer Parts
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Dixie Machinery Mfg. Co.
Smidth, F. L., & Co.

Pulverizers (Hammer, Ring, Rod & Roll) (See Also Mills & Crushers)
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Blaw-Knox Co.
Brooks Equipment & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)
Combustion Engr. Corp.
Dixie Machy. Mfg. Co.
Lewistown Foundry & Mach. Co.
New Holland Machine Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Pumps (Diaphragm)
Jaeger Machine Co.

Pumps (Dredge)
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.
Hetherington & Berner, Inc.
Morris Machine Wks.

Pumps (Dry Pulverized Material)
Fuller Company
Morris Machine Works
Smidth, F. L., & Co.

Pumps (Slurry)
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Morris Machine Wks.
Smidth, F. L., & Co.
Wilfley, A. R., & Sons, Inc.

Pumps Valves (Slurry)
Fuller Co.
Wilfley, A. R., & Son, Inc.

Pumps (Vacuum)
Allis-Chalmers Mfg. Co.
Fuller Company
Smidth, F. L., & Co.

Pump Valves (Dry Pulverized Material)
Fuller Co.

Pumps (Water)
Allis-Chalmers Mfg. Co.
Jaeger Machine Co.
Morris Machine Wks.

Rectifiers
Allis-Chalmers Mfg. Co.

Recuperators
Traylor Engineering & Mfg. Co.

Refractories
Mexico Refractories Co., Mexico, Mo.
Smidth, F. L., & Co.

Regulators (Voltage)
Allis-Chalmers Mfg. Co.

Respirators
American Optical Co.

Rewashers (Screw)
Link-Belt Co.
Smith Engineering Works

Roofing
Ryerson, Jos. T., & Son, Inc.
Texas Co.

Rope (Transmission)
Allis-Chalmers Mfg. Co.

Sand Drags
Eagle Iron Wks.
Link-Belt Co.
Smith Engr. Wks.

Sand and Gravel Plants
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Eagle Iron Works
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Sand Separators
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Smith Engineering Wks.

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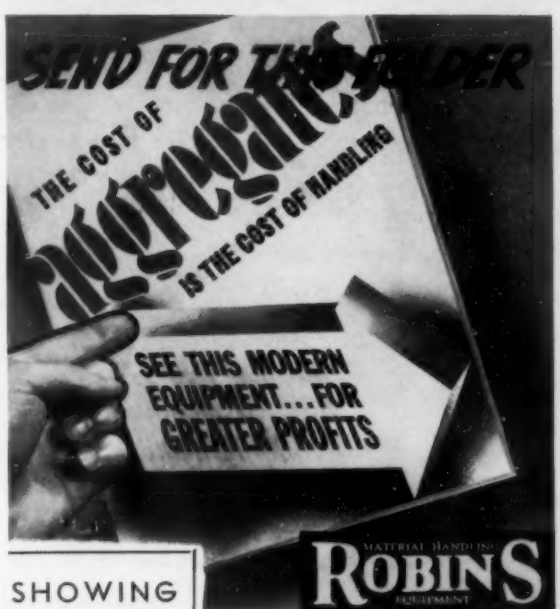

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Scrubbers and Dryers

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TON-CAP

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Classified Directory (Cont.)

Sand Settling Tanks
Eagle Iron Wks.
Hendrick Mfg. Co.
Link-Belt Co.
Nordberg Mfg. Co.
Pioneer Engineering Wks., Inc.
Smith Engr. Wks.

Scales (Conveyor)
Merrick Scale Mfg. Co.

Scales (Hopper)
Merrick Scale Mfg. Co.

Scales (Truck and Track)
Merrick Scale Mfg. Co.

Scrapers (Power Drag)
Austin-Western Road Machy. Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Company
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Sauerman Bros., Inc.

Screen Cloth & Plates (Perforated)
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Chicago Perforating Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Ryerson, Jos. T., & Sons, Inc.
Traylor Engineering & Mfg. Co.
Wickwire-Spencer Steel Co.

Screen Parts
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Hendrick Mfg. Co.
Pioneer Engineering Wks., Inc.
Traylor Engineering & Mfg. Co.
Wickwire-Spencer Steel Co.

Screens (Grizzly)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Eagle Iron Works
Hendrick Mfg. Co.
Lewistown Foundry & Mach. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Productive Equipment Corp.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Tyler, W. S., Co.
Universal Vibrating Screen Co.

Screens (Laboratory)
Allis-Chalmers Mfg. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Smidth, F. L., & Co.
Tyler, W. S., Co.
Wickwire-Spencer Steel Co.
Williams Patent Crusher & Pulv. Co.

Screens (Revolving)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Eagle Iron Wks.
Haiss, Geo., Mfg. Co., Inc.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.
Tyler, W. S., Co.

Screens, Scalping
Allis-Chalmers Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Smith Engineering Works
Williams Patent Crusher & Pulv. Co.

Screens (Trommel)
Traylor Engr. & Mfg. Co.

Screens (Vibrating)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Eagle Iron Works
Lewistown Fdry. & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smith Engineering Works
Sturtevant Mill Co.
W. S. Tyler Co.
Universal Vib. Screen Co.
Wickwire-Spencer Steel Co.
Williams Patent Crusher & Pulv. Co.

Screws (Cap, Self Locking, Set, Hollow Set)
Standard Pressed Steel Co.

Seal Rings
Traylor Engineering & Mfg. Co.

Semi-Trailers, Quarry (Side & End dumping)
Easton Car & Const. Co.

Shafting
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Link-Belt Co.

Shale Planers
Eagle Iron Wks.

Sheaves
Allis-Chalmers Mfg. Co.
Eagle Iron Works
Haiss, Geo., Mfg. Co.
Hetherington & Berner, Inc.
Link-Belt Co.

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Better production at lower costs. For continuous or batch operation, equipped to automatically totalize the weight of all material handled.

Bulletin No. 375 on Weightometer
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FEED-O-WEIGHT

Classified Directory (Cont.)

McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Sauerman Bros.

Shovels (Compressed Air)
Nordberg Mfg. Co.

Shovels, Power (Diesel, Diesel-Air, Electric, Gasoline, Gas-Electric, Oil & Steam)
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.
Thew Shovel Co.

Shovels (Tractor)
Austin-Western Road Machy. Co.
Koehring Co.
Link-Belt Co.

Shovels (Truck)
Thew Shovel Co.

Shovels (Underground)
Allis-Chalmers Mfg. Co.
Nordberg Mfg. Co.
Thew Shovel Co.

Shredders
Williams Patent Crusher & Pulv. Co.

Sieves (Testing)
Hendrick Mfg. Co.
Smidth, F. L., & Co.
Tyler, W. S., Co.

Silos
Blaw-Knox Co.
F. L. Smidth & Co.

Silo Stave Machines (Concrete)
Besser Mfg. Co.

Skids
Besser Mfg. Co.
Easton Car & Const. Co.

Slakers (Rotary)
Traylor Engineering & Mfg. Co.

Slugs (Grinding)
Smidth, F. L., & Co.

Slurry Mixers
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Slurry Separators
Smidth, F. L. & Co.

Slurry Thickeners
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Smokestacks
Hendrick Mfg. Co.
Traylor Engineering & Mfg. Co.

Speed Reducers
Abart Gear and Machine Co.
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Spouts
Link-Belt Co.
Traylor Engineering & Mfg. Co.

Sprockets
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.

Standpipes
Ross Screen & Feeder Co.

Steel, Abrasion Resisting
Joseph T. Ryerson & Son, Inc.

Steel (Electric Furnace)
Timken Roller Bearing Co.

Steel (Open Hearth)
Timken Roller Bearing Co.

Steel (Special Alloy)
Timken Roller Bearing Co.

Stokers
Combustion Engineering Corp.
Link-Belt Co.

Storage Equipment
Barber-Greene Co.
Blaw-Knox Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Stucco Colors
Mepham, Geo. S., Corp.

Switchboards
Allis-Chalmers Mfg. Co.

Tampers (Power & Hand)
Besser Mfg. Co.
Multiplex Concrete Machy Co.

Tanks
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Combustion Engineering Corp
Eagle Iron Works
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Raymond Pulverizer Division
Traylor Engineering & Mfg. Co.

Towers
Blaw-Knox Co.
Eagle Iron Works
Hendrick Mfg. Co.
Jaeger Machine Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Track & Track Equipment
Besser Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)
Nordberg Mfg. Co.

The Most Universally Used Belt Lacing on Earth
GENUINE
ALLIGATOR
TRADE MARK REG. U.S. PAT. OFFICE
STEEL BELT LACING
Ease of application, "Never Lets Go," the sectional rocker hinge pin, smoothness on both sides, flexibility and separability make genuine Alligator the most universally used Steel Belt Lacing. Clinched teeth prevent ply separation in belt ends. Twelve sizes for flat belts of all types up to ⅝ in. thick. Standard Boxes, Handy Packages and special long lengths. Also made in Monel and alloys. Sold throughout the world.
Sole Manufacturers
FLEXIBLE STEEL LACING COMPANY
4684 Lexington St., Chicago
In England at 16 Westmoreland Place, London, N. 1.
"JUST A HAMMER TO APPLY IT"
REG. U.S. PAT. OFF.

STOP that continual fussing around with a wrench

It's easy to eliminate the work of tightening up your equipment
JUST INSTALL . .

UNSHAKO
The Nuts that can't shake loose

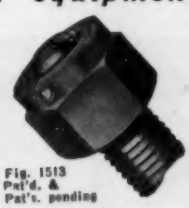


Fig. 1513 Pat'd. & Pat's. pending

Put "Unshakos" on every bolt or stud on your equipment where vibration or jarring keeps loosening the nuts that are now there. "Unshakos" have the built-in locking ring that's always ready to spring to life and grab a tight hold at the slightest tendency to back off. This one piece feature saves you plenty of time while installing, too. In fact they're two way time savers. Write us for full particulars and prices. You won't be obligated.

STANDARD PRESSED STEEL CO.
BRANCHES BOSTON DETROIT INDIANAPOLIS
JENKINTOWN, PENNA.
Box 563
BRANCHES CHICAGO ST. LOUIS SAN FRANCISCO

WILFLEY
centrifugal SAND PUMPS
for Slurries, Sand Tailings, Slimes, Acid Sludges

Save Pumping Costs

Continuous operation without attention for long periods. Stuffing box, stuffing, gland water ALL eliminated. Close clearances maintained by easy slippage seal adjustment. Heavy pumping parts of material best suited for YOUR particular problem. Complete engineering service. Prompt shipment of parts. The most efficient and economical pump you can buy. *Write for Complete Catalog*

A. R. WILFLEY & SONS, Inc., Denver, Colo., U. S. A.
NEW YORK OFFICE: 1775 BROADWAY

"PENNSYLVANIA"
REVERSIBLE HAMMERMILL

has set up new standards of efficiency and reduced overall costs.

1. Daily reversal of rotor resharpens Hammers and Cage Bars. **NO MORE MANUAL TURNING OF HAMMERS.**
2. Duplex cages independently adjusted, to compensate for Hammer and Cage wear.
3. Major reduction by smashing head-on impact.
4. High Drop feed, placing material well in front of each Hammer.
5. Additional screening surface increases capacity of output.

PENNSYLVANIA CRUSHER COMPANY

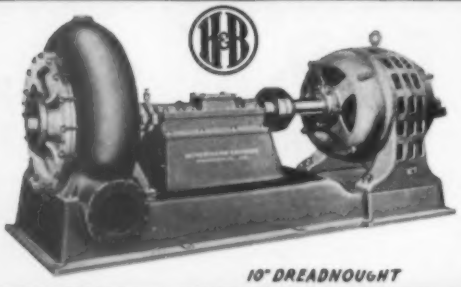
Liberty Trust Bldg.,
PHILADELPHIA, PA.

PERFORATED METAL
SAND AND GRAVEL SCREENS

Manufactured exactly to your specifications
Any size or style screen, in thickness of steel wanted with any size perforation desired.
We can promptly duplicate your present screens at lowest prices.

CHICAGO PERFORATING CO.
2443 West 24th Place
CHICAGO, ILLINOIS
Canal 1459

SAND *and* GRAVEL PUMPS



10" DREADNOUGHT

HETHERINGTON & BERNER INC.
701-745 KENTUCKY AVENUE · · · · · INDIANAPOLIS, INDIANA

SELECTRO
VIBRATING SCREEN

WET OR DRY
COARSE OR FINE
SCREENING

Write for "DATA BOOK"

PRODUCTIVE EQUIPMENT CORP.
4600 SOUTH KEDZIE AVENUE CHICAGO, U.S.A.

Classified Directory (Cont.)

Track Shifters
Nordberg Mfg. Co.

Track Systems (Overhead)
Link-Belt Co.

Tractors
Allis-Chalmers Mfg. Co.
Koehring Co.

Tractors (Electric)
Link-Belt Co.

Trailers (Industrial & Quarry)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Easton Car & Const. Co.
Koehring Co.

Transformers
Allis-Chalmers Mfg. Co.

Trucks (Agitator)
Blaw-Knox Co.

Trucks (Dump)
Ford Motor Co.

Truck Bodies (Dump)
Commercial Shearing & Stamping Co.
Easton Car & Const. Co.
Ford Motor Co.

Trucks (Electric)
Easton Car & Const. Co.

Trucks (Gas-Electric)
Easton Car & Const. Co.

Trucks (Hand)
Standard Pressed Steel Co.

Trucks (Industrial)
Easton Car & Const. Co.
Standard Pressed Steel Co.

Trucks (Mixers)
Blaw-Knox Co.
Jaeger Machine Co
Smidth, F. L., & Co
Smith, T. L., Co., The

Tubing (Seamless Steel)
Timken Roller Bearing Co

Turbines
Allis-Chalmers Mfg. Co.

Turnbuckles
Macwhyte Co.

Turntables (Industrial)
Easton Car & Const. Co.

Unloaders
Barber-Greene Co.
Bucyrus-Erie Co.
Fuller Company
Haiss, Geo., Mfg. Co.
Link-Belt Co.
New Holland Machine Co.
Robins Conveying Belt Co.

Unloaders (Boat)
Link-Belt Co.

Unloaders (Box Car)
Barber-Greene Co.
Besser Mfg. Co.
Fuller Co.
Link-Belt Co.

Unloaders (Pneumatic)
Fuller Company

Unloaders (Underground)
Nordberg Mfg. Co.

Ventilating Apparatus
Blaw-Knox Co.

Vibrators
Link-Belt Co.
W. S. Tyler Co.

Wagons (Dump)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Blaw-Knox Co.
Easton Car & Const. Co.
Koehring Co.

Washers (Log)
Allis-Chalmers Mfg. Co.
Eagle Iron Works
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Smith Engineering Works
Traylor Engr. & Mfg. Co.

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Eagle Iron Works
Haiss, Geo., Mfg. Co.
Hendrick Mfg. Co.
Lewistown Foundry & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Smith Engineering Wks.
Traylor Engr. & Mfg. Co.
Tyler, W. S., Co.
Universal Vibrating Screen Co.
Wickwire-Spencer Steel Co.

Weighing Equipment
Blaw-Knox Co.
Fuller Company
Jaeger Machine Co.
Merrick Scale Mfg. Co.

Welding Electrodes
American Steel & Wire Co. (U. S. Steel Corp. Subsi.)

Welding & Cutting Equipment
Wickwire-Spencer Steel Co.

Welding Rods
Ryerson, Jos. T., & Son, Inc.

Welding Wire
Wickwire-Spencer Steel Co.

Winches
Link-Belt Co.
Robins Conveying Belt Co.

Wire Cloth
Bacon, Earle C., Co.
Cleveland Wire Cloth & Mfg Co.
Eagle Iron Works
Leschen, A., & Sons Rope Co.
Link-Belt Co.
Ludlow-Saylor Wire Co.
National Wire Cloth Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Tyler, W. S., Co.
Universal Vibrating Screen Co.
Wickwire-Spencer Steel Co.

Wire (Copper, Iron & Steel)
Wickwire-Spencer Steel Co.

Wire (Electric)
Wickwire-Spencer Steel Co.

Wire Rope
American Cable Co., Inc.
Jones & Laughlin Steel Corp.
A. Leschen & Sons Rope Co.
Macwhyte Co.
Union Wire Rope Corp.
Wickwire-Spencer Steel Co.

Wire Rope Clips
American Cable Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Wickwire-Spencer Steel Co.

Wire Rope Fittings
American Cable Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Wickwire-Spencer Steel Co.

Wire Rope Hooks
American Cable Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Wickwire-Spencer Steel Co.

Wire Rope Lubricants
Macwhyte Co.

Wire Rope Slings
American Cable Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Wickwire-Spencer Steel Co.

Wire Rope Sockets
American Cable Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Wickwire-Spencer Steel Co.

Wire Rope Thimbles
Macwhyte Co.

HAYWARD BUCKETS

USE RIGHT BUCKET FOR THE JOB

Hayward makes all four—clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.

THE HAYWARD COMPANY
202-204 Fulton Street
New York, N. Y.

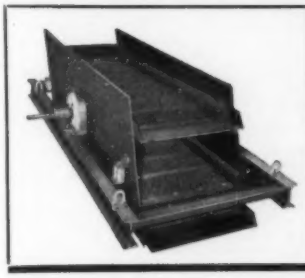
RYERSON CERTIFIED STEELS

UNIFORM HIGH QUALITY STEELS

. . . . at No Extra Cost

Accurately controlled by definite specifications, Ryerson Certified Steels represent the highest quality obtainable in each class and type of material. Special abrasion resisting steels, perforated metals and other products for the Rock Products industry are included. A special plan on alloy steels gives the user exact date on every bar. When you need steel, phone, wire or write the nearest Ryerson plant. Immediate Shipment is assured. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON *Certified* **STEELS**



NEW HOLLAND Vibrating Screens

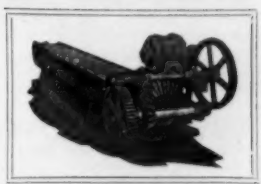
Are Built for YOUR Requirements

Insuring large capacity, strength, durability, long life, low upkeep and convenience in operation.

Write for illustrated literature covering NEW HOLLAND Vibrating Screens, Crushers and Crushing Rolls.

NEW HOLLAND MACHINE CO. NEW HOLLAND PENNA.

Why ship dirty stone when it can be made clean easily and so economically?



SCRUBBER

This scrubber will do the good work.

State Capacity Required!

LEWISTOWN FOUNDRY & MACHINE CO.

Mfrs. of Sand Crushing, Grinding, Washing and Drying Machinery

LEWISTOWN - - - - - PENN.

MORRIS

CENTRIFUGAL PUMPS • DREDGES • STEAM ENGINES

For abrasive mixtures, corrosive liquids, or clear water. Any capacity, head, or method of drive.

For sand and gravel production, water supply, reservoirs, filling in, or waterways improvements.

Vertical reciprocating type, single and double cylinders, compound and triple expansion, 3 to 1000 hp.

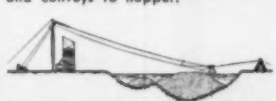
Write for Bulletins

MORRIS MACHINE WORKS
Baldwinsville, N. Y.

SAUERMAN LONG RANGE MACHINES

For Digging, Conveying, Stockpiling

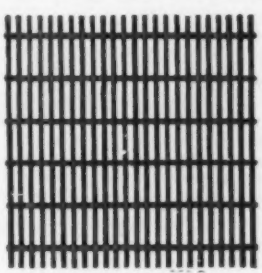
Sauerman Drag Scraper loads automatically in pit, bank or storage pile and conveys to hopper.



Sauerman Slackline Cableway digs, conveys, elevates and dumps in one operation.

Whether your problem is to dig gravel from a pit, bank or river, or to convey loose rock from quarry to crusher, or to stockpile and reclaim surplus products—there is a type and size of Sauerman machine to meet your needs. Write for catalog.

SAUERMAN BROS., Inc.
430 S. Clinton St., Chicago



Rolled Slot

ALLOY No. 2

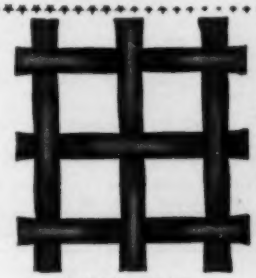
STAR PERFORMERS

CLEVELAND SCREENS are star performers—returning larger capacities, increased profits and more accurate separations at lower cost. Cleveland Screens save money with the initial investment because, if they are made of the longer-wearing, wear-resisting ALLOY NO. 2—Cleveland Screens stay on the job long after ordinary screens would have been replaced.

★ ★

THE CLEVELAND WIRE CLOTH & MFG. CO.

3574 E. 78TH STREET . . . . . CLEVELAND, OHIO



2 Mesh .162 Ga.

MORE PROFITS FOR YOU

Classified Advertisements

POSITIONS WANTED — POSITIONS VACANT Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION—Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, 30 inches to the page.

CLASSIFIED—Displayed or undisplayed. Rate per column inch, $5.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

Used Equipment for Sale

CONSOLIDATED
GOOD USED EQUIPMENT

SELECTED SPECIALS

JAW CRUSHERS:
10x15, 13x30, 15x30, 24x36 Farrel; 18x30, 24x36 Allis Chalmers; 30x60, 36x42 Traylor.

CRUSHING ROLLS:
1—42"x16" "B" Allis Chalmers, used one month; 24x14", 36x16" A-C; 20x14" Sturtevant; 30x10" Traylor; 24x20", 18x16" single roll crushers.

PULVERIZERS:
Raymond 4 and 5 roll high and low side, also two No. 60 Imp. and rigid beater types; 24" Mikro; and other types.

AIR CLASSIFIERS:
10' Sturtevant; 5', 8', 12' Gayco.

BALL, ROD AND TUBE MILLS:
No. 32 Marcy, 6'x22" Hardinge, 3x12' Hendy, 5x22' Gates, all iron lined; 5x10' Marcy, 6'x12' Hardinge Rod Mills.

HAMMER MILLS:
36x36" Gruendler with roller bearings, all new mang. parts; 36x24 Gruendler; 24x20, 24x12 Jeffrey; larger and smaller sizes.

ROTARY KILNS AND DRYERS:
1—6'x60', ⅝" shell, silent chain drive and motor. Will be sold with or without motor driven Detroit Underfeed Stoker. 1—9'6"x150' Rotary Kiln — also smaller sizes. 12—Rotary Dryers: 3x30, 4x30, 5x30, 5x60, 6x40, 6x60, 8x60, 9x65'.

Send for Illustrated Circulars.

Consolidated Products Co., Inc.

15-16-17 Park Row New York City
8 Acre Plant & Shops at Newark, N. J.

Selected Items Of Modern Equipment

Penn Trojan Hammermill, 50-hp. direct elec.
Jeffrey 'Junior' Belted Hammer Mill.
Kennedy 37 Gyra. Gearless Crusher, 50-hp.
Champion No. 6 Jaw Crusher, 12"x26" Opening.
B-G. 24" Reciprocating Plate Feeder, 3-hp.
5 Hummer 2-deck Vib. Screens, V-16 & V-40.
Link-Belt 1-deck 3x8 Vib. Screen, V-belt.
Leahy 2-deck 3x6 Vibrating Screen, elect.
4—60" Link-Belt Automatic Sand Tanks.
Centrif. Electric Water Pumps, 3 to 50-hp.
10"x24' Closed Vert. Chain Bucket Elevator.
14"x32' Open Vert. Chain Bucket Elevator.
16"x75' Open Vert. Chain Bucket Elevator.
Manganese Pintle Chain, 6" Pitch, 400 Ft.
24"-Ga. Track & Switches. Flat & Dump Cars.
36" 4-ton Gas Locomotive & 6—2 yd. Cars.
Std. Ga. 8-ton Vulcan Gas Locomotive.
3 Storage Tanks, 10,000-gal. 2" Steam Coils.
Patterson Kelley Feed Water Heater, 800-hp.
2—Drum Gasoline Hoists, 20 and 40-hp.
1—Drum Variable Speed 60-hp. Mine Hoist.
I-R type XCB Air Compressor, 676 C.F.M.
I-R type ER1 Air Compressor, 12x10 cyls.
Marion 1-yd. Electric Shovel, caterpillars.
Star ¾-yd. Full-Revolving Gas Shovel.
45-ft. Koehring Crane Boom, for type 301.
Hayward Clamshell Material Bucket, ½-yd.
Blaw-Knox Clamshell Digging Bucket, ¾-yd.
18"x35' Hales Portable Belt Conveyor, gas.
14" to 36" Wide Belt Conveyor Equipment.
24" Used Conveyor Belt, 5-ply, 2000 Feet.
150—42" Flat Idlers For Picking Belt.
20"x7' Jeffrey Steel Apron Conveyor Feeder.
L-B Package Conveyor, 30"x32', steel frame.

G. A. UNVERZAGT
15 PARK ROW, NEW YORK CITY

FOR SALE

1—Vulcan Direct Heat Dryer, 3' x 30'.
4—Stearns Rogers Tube Mills 5' x 22' Silex lined.
1—Gates Tube Mill 5 x 21 Silex lined.
1—Bonnot Tube Mill 5' x 18', Silex lined.
1—Dorr Classifier, 12 ft. inside diameter bowl.
2—H. T. boilers, size 72 x 20.
3—H. T. boilers, size 72 x 18.
1—Marine boiler, 250 H.P.
5—Steel smoke stacks, 36" x 60'—10 gauge.
1—Chuse Engine 11 x 12 single valve.
1—Hoisting engine.
1—Steam traction engine, Double cylinder.
1—No. 0 Raymond Pulverizer.
1—Crane Gate Valve 10".
1—Multi-Foote, ¼ yd. concrete mixer—caterpillar tractor.
1—Well drill, gasoline tractor.
1—Osgood ⅞ yd. steam shovel.
1—Webb City Jaw Crusher, 18x10.
1—Shaker Screen 8 x 2.
1—Burr Mill, 36", ball bearing.

WANTED TO BUY

1—Indirect Heat Dryer, 7 T. per hr. capacity.
1—Rotary Steam Dryer, 6 x 35—40.

Illinois Minerals Company
CAIRO, ILLINOIS

STANHOPE OFFERS

AIR COMPRESSORS
BELTED: 255, 528, 676, 1000, 1300 & 1570 Ft.
ELECTRIC: 478, 676, 807, 1302 & 1722 Ft.
DIESEL: 603, 807 & 1000 Ft.
PORTABLE GAS: 110, 160, 220, 310 & 540 Ft.
STEAM: 49, 310, 528 & 1300 Ft.

CLAMSHELL BUCKETS
2 Yd. OWEN Type S Material Handling.
1⅛ Yd., 1 Yd. & ⅞ Yd. HAYWARD Class E.

CRANES & DRAGLINES
12 Ton NORTHWEST 50 Ft. Boom Gas.
12 Ton KOEHRING 45 Ft. Boom Gas.
25 Ton BROWNING & 30 Ton AMERICAN Locomotive Type.
25 Ton LINK BELT K-48 Electric, 70 Ft. Boom.

CATERPILLAR SHOVELS
¾ Yd. BYERS Electric.
⅝ Yd. KOEHRING Gasoline.
¾ Yd., 1¼ Yd. & 2 Yd. MARION Electrics.
1 Yd. NORTHWEST Gas.
1½ Yd. BUCYRUS 41B Steamer.

DUMP CARS
46—KOPPEL 1½ Yd. 24 & 30 In. Ga., V Shaped.
15—2 Yd., 3 Yd., 4 Yd. 36 In. Ga.
20—Std. Ga. 12 Yd., 16 Yd. & 20 Yd. Cap.
15—Std Ga. 50 Ton Battleship Gondolas.

FLAT CARS
30—5 ton capacity 36" Ga. Flat Cars.
9—50 ton std. ga. heavy duty flat cars.

BALL, ROD AND TUBE MILLS
5' x 22" HARDINGE CONICAL Dry Ball Mill.
3' x 36" HARDINGE CONICAL Wet Ball Mill.
3' x 8" HARDINGE CONICAL Dry Ball Mill.
6' x 22" HARDINGE CONICAL Pebble Mill.
8' x 22" HARDINGE CONICAL Ball or Pebble Mill.
4x8, 8x6 & 10x9 Straight Ball Mills.
4x16, 5x18 & 5x22 Tube Mills.
3½x8 & 5x7 Air Swept Tube Mills.
2x4½, 3x10 & 5x12 ROD MILLS.

PULVERIZERS
RAYMOND Auto. Pulverizer No. 0000, 0 & 3.
RAYMOND Imp Mills No. 4, 32 & 55.
GRUENDLER XXB Mill & Jay Bee No. 3 & 4.
RAYMOND 4 & 5 ROLL MILLS.

STEEL STORAGE TANKS
10,000 Gal., 15,000 Gal. & 20,000 Gal. Cap.

250 H.P. SYNCHRONOUS MOTOR
250 H.P., G.E., 900 rpm., 3 P., 60 C., 440 Volt.

400 BARREL CEMENT BIN
400 Barrel Butler Portable Steel Cement Bin with Fuller automatic batcher, push button control, including motor.

SEPARATORS AND COLLECTORS
Gayco 5 ft. and 12 ft. Separators
Type 360 Sly 8x24, 8x52 and 16x42 Dust Collectors.

ROLL CRUSHERS
36x60 Fairmount.
24x12 Power & Mng. Smooth Roll.

JAW CRUSHERS
10x8, 13x7½, 14x7, 15x9, 15x10, 16x9, 16x12, 16x10, 18x11, 20x8, 20x6, 20x10, 20x12, 20x11, 26x12, 30x15, 30x13, 36x30, 36x18, 36x14, 36x9, 36x6, 38x18, 36x10, 36x24, 42x9, 48x36, 60x42, 84x66, 36x16, 9x36, 12x26 Champion, Screen & Elevator.

CONE & GYRATORY CRUSHERS
18 in., 24 in., 30 in., 36 in. and 48 in. Symons Disc.
4—10 TZ Traylor 4 ft. Gyratory.
4—Nos. 5, 3 & 6 Austin Gyratory.
2—Traylor T-12 Bulldog Gyratory.
8 in. Traylor T. Gyratory.
17 Gates K—Nos. 3, 4, 5, 6, 7½, 8 & 9½.
10 Inch Austin Model 105.
10 & 13 Inch Superior McCullys.

BUCKET ELEVATORS
7 Steel Encased Chain & Belt Elevators:
15 in. by 60 ft., 24 in. by 63 ft., 18 in. by 48 ft. 12 in. by 36 ft.
ELEVATOR BELT: 600 Ft., 30 In.—1236 Ft. 20 In. & 18 In.

CONVEYOR PARTS
BELT: 1000 Ft. 60 In., 700 Ft. 42 In., 600 Ft. 36 In., 800 Ft. 30 In., 1642 Ft. 24 In., 517 Ft. 20 In., 297 Ft. 18 In.
IDLERS: 36 In., 30 In., 24 In., 20 In., 18 In.
Head & Tail—Pulleys—Takeup for all sizes.
Steel Frames: 2,000 ft. 24 In., 30 In. & 36 In. Sections.

ROTARY DRYERS AND KILNS
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....Engines (Diesel, Gasoline, Steam)
....Feeders
....Fence Post Molds & Machines (Concrete)
....Floor Tile Machines (Concrete)
....Garbage Receptacle Molds (Concrete)
....Garden Furniture Molds (Concrete)
....Generators & Motor Generator Sets
....Greenhouse Bench Forms (Concrete)
....Guns (Hydraulic)
....Gutter Block Machines (Concrete)
....Hoists
....Hoppers
....Hose
....Hydrators (Lime)
....Joist & Slab Machines (Concrete)
....Kilns (Rotary, Shaft, Vertical)
....Laboratory Apparatus
....Laundry Tub Molds (Concrete)
....Light Post & Standard Forms
....Lime (Hydrated)
....Lime Handling Equipment
....Lime Plants
....Lime Putty Plants
....Loaders
....Locomotives
....Mills (Ball, Compartment, Emery, Hammer, Rod, Roll, Tube)
....Mortar Mixers
....Pallets (Steel, Wood)
....Pans, Grinding (Wet & Dry)
....Perforated Metal
....Pipe Molds and Machines (Concrete)
....Pipe
....Plaster Mixers
....Pontoons
....Pulverizers
....Pumps (Pulverized Material)
....Railway Equipment
....Rectifiers
....Recuperators
....Refractories
....Rewashers (Screw)
....Rock Wool Cupolas
....Roofing Tile Machines
....Sand Drags
....Sand & Gravel Plants
....Sand Lime Brick Machinery
....Sand Settling Tanks
....Scales
....Scrapers (Power Drag)
....Screens (Revolving, Vibrating, Etc.)
....Seal Rings
....Septic Tank Molds (Concrete)
....Sewer Pipe Machines (Concrete)
....Shale Planers
....Shovels (Power)
....Sidewalk Forms
....Sill Forms (Concrete)
....Silos (Storage)
....Silo Stave Machines
....Slakers (Rotary)
....Slurry Mixers
....Slurry Pumps
....Slurry Separators
....Slurry Thickeners
....Step Forms (Concrete)
....Tampers (Hand & Power)
....Tanks (Storage)
....Tractors
....Trucks (Agitator)
....Trucks (Dump)
....Trucks (Industrial)
....Trucks (Mixer Body)
....Unloaders
....Unloaders (Boat)
....Unloaders (Box Car)
....Wagons (Dump)
....Wall Forms & Machines (Concrete)
....Washers (Sand, Gravel & Stone)
....Welding & Cutting Equipment
....Well Curbing Machine & Molds (Concrete)
....Wire Cloth
....Wire (Copper, Iron & Steel)
....Wire Rope

Firm Name _____
Individual _____ *Title* _____
Address _____
City _____ *State* _____

$ave with $mith-Mobile

When you operate a new Smith-Mobile, instead of an old style truck-mixer, it's like adding $500 to your bank account. For Smith-Mobile's high discharge eliminates the necessity for a rear end hoist. You not only save about $500 in the initial investment, you also avoid hoist maintenance and operating costs. In addition, you materially cut down the dead load of your truck-mixer.

Smith-Mobile high discharge allows a much steeper angle for the distributing spout. Covers a greater area even with dry concrete. Permits you to discharge directly into high forms. Not even a ramp is required.

There are many other exclusive Smith-Mobile features: Feed Chute Charging, Visible Mixing, etc. Before you buy your next truck-mixer, be sure to investigate Smith-Mobile.

The T. L. SMITH COMPANY
2885 North 32nd St. • Milwaukee, Wis.

The discharge height of a 2 cu. yd. Smith-Mobile, mounted on average truck, is 73". Other truck-mixers range from only 44½" to 47½".
73"

SMITH-MOBILE
THE *Modern* TRUCK MIXER and AGITATOR

A 2383-½

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KOEHRING

LONG REACH HIGH LIFT

High lift and long reach cut excavating costs with Koehring Shovels. . . . The Koehring independent and positive crowding action spots the dipper beyond and above the end of the boom or wherever it may be desired. . . . This 5/8 yard Koehring Shovel is operating in a brick plant where high lift and long reach are essential for maximum production.

KOEHRING COMPANY
CONSTRUCTION EQUIPMENT • MILWAUKEE, WISCONSIN

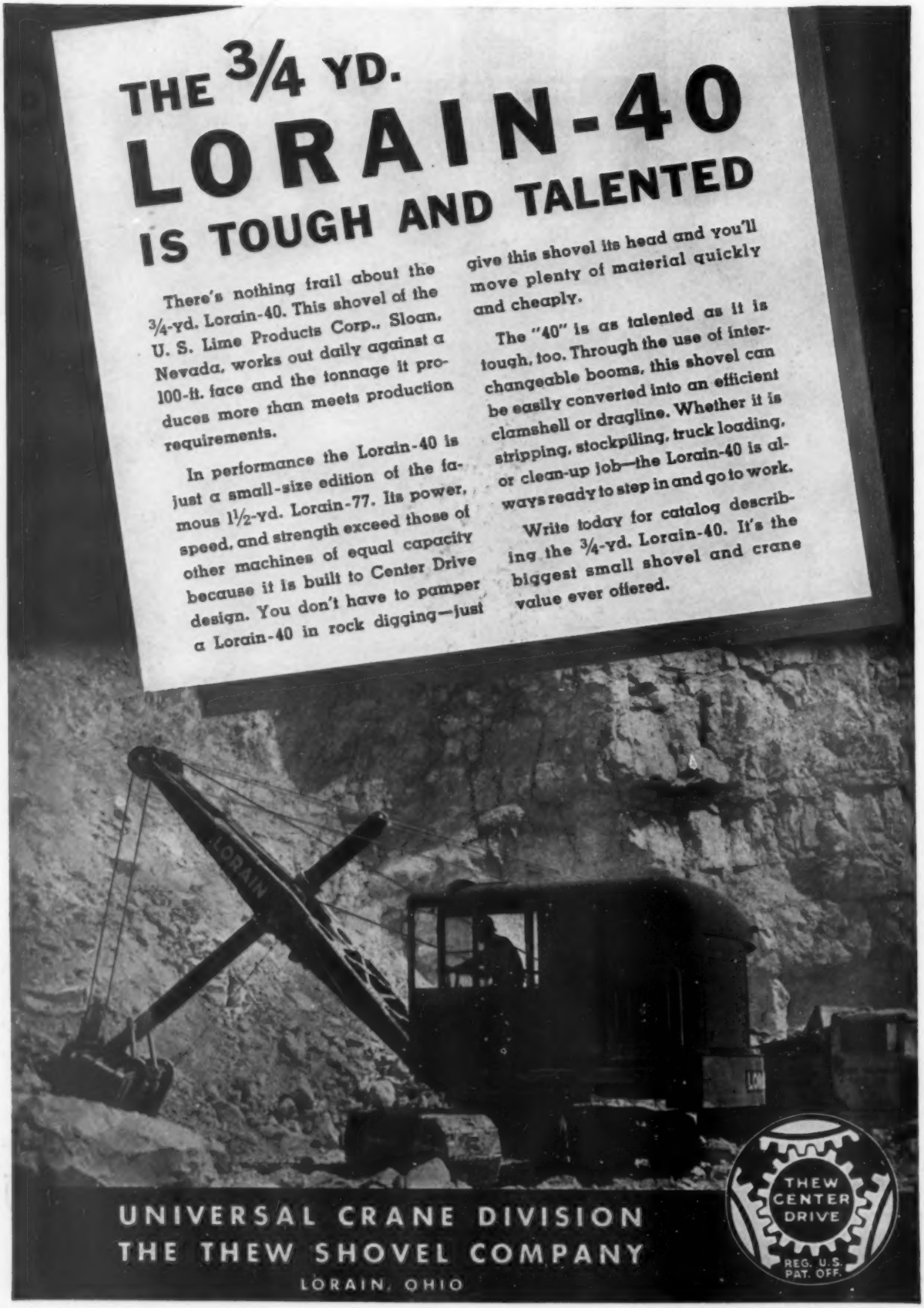
THE 3/4 YD. LORAIN-40 IS TOUGH AND TALENTED

There's nothing frail about the 3/4-yd. Lorain-40. This shovel of the U. S. Lime Products Corp., Sloan, Nevada, works out daily against a 100-ft. face and the tonnage it produces more than meets production requirements.

In performance the Lorain-40 is just a small-size edition of the famous 1½-yd. Lorain-77. Its power, speed, and strength exceed those of other machines of equal capacity because it is built to Center Drive design. You don't have to pamper a Lorain-40 in rock digging—just give this shovel its head and you'll move plenty of material quickly and cheaply.

The "40" is as talented as it is tough, too. Through the use of interchangeable booms, this shovel can be easily converted into an efficient clamshell or dragline. Whether it is stripping, stockpiling, truck loading, or clean-up job—the Lorain-40 is always ready to step in and go to work.

Write today for catalog describing the 3/4-yd. Lorain-40. It's the biggest small shovel and crane value ever offered.



UNIVERSAL CRANE DIVISION
THE THEW SHOVEL COMPANY
LORAIN, OHIO

BUY ACCO QUALITY
TRADE MARK

● Rope replacement costs you more than merely the price of the new rope. When a rope fails, production stops. Men and machinery are idle. Time is lost. These are the things that make some ropes really costly.

Of course TRU-LAY Preformed wears out in time but it lessens your worries by lasting longer and *reducing* shutdowns. More than this, TRU-LAY is easier to handle and faster to reeve. It resists kinking or whipping and spools perfectly on the drum.

During the past fourteen years literally thousands of operators have found TRU-LAY Preformed wire rope to be a production booster through its ability to wear longer. Specify TRU-LAY Preformed for your next line.

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE COMPANY, Inc.
WILKES-BARRE, PENNSYLVANIA

District Offices: Atlanta, Chicago, Detroit, Denver, Los Angeles, New York, Philadelphia, Pittsburgh, Houston, San Francisco.

GREEN SIGNIFIES SAFETY

A FEW OF THE 137 AMERICAN CHAIN & CABLE INDUSTRIAL PRODUCTS

AMERICAN CHAIN DIVISION
(DOMINION CHAIN COMPANY, Ltd., in Canada)
Weed Tire Chains • Welded and Weldless Chain • Malleable Castings
Acco-Morrow Lubricators

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Tru-Lay Preformed Wire Rope • Tru-Loc Processed Fittings • Crescent Brand Wire Rope
Tru-Stop Brakes • Tru-Level Oil Controllers

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FORD CHAIN BLOCK DIVISION
Chain Hoists • Trolleys

HIGHLAND IRON & STEEL DIVISION
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Electric Steel Castings, Rough or Machined Railroad Specialties

WRIGHT MANUFACTURING DIVISION
Chain Hoists • Electric Hoists and Cranes

In Business for Your Safety

TRU·LAY *Preformed* WIRE ROPE

ALL AMERICAN CABLE DIVISION ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

Construction's Going Up . . .

NOW is the best time to consider modernization of your quarry equipment. The emergency spending program to which the Federal Government is committed, the regular Federal-Aid highway program, and the recent steady gains in private construction only foreshadow the real boom in normal building and construction which is ahead.

If you are in a position to swing into big production at today's low costs, you will be able to make the most of the coming up-swing *the moment it breaks*. You may not want to buy new equipment now, but you will be wise to plan modernization so you can go ahead without costly delay.

Bucyrus-Erie offers you the most complete modern line of big-output quarry machines available. It will pay you to get ready to profit from the up-swing by considering the Bucyrus-Erie machine best fitted for your needs, and by figuring the actual low-cost, high-volume loading you can get with these "Years Ahead" excavators.

Plan now and profit tomorrow!

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, WISCONSIN